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Union Bag Starts Second Unit of Savannah

The New Addition Will Produce 40,000 Tons of Kraft Paper Annually and Will Duplicate the Unit Opened July of Last Year — Construction of Third Unit Is Now Under Way and Should Be Completed This Fall.

The second unit of Union Bag and Paper Corporation's new paper mill at Savannah, Georgia, went into production last week, according to a statement issued by Alexander Calder, president of the company. The new unit, designed to produce 40,000 tons of kraft paper annually, will duplicate the capacity of the first unit opened July, last year, and will result in an estimated saving to the company of an additional $1,000,000 a year, as compared with buying paper in the open market or making it in the North, Mr. Calder said. Construction of the second unit, begun in October, 1936, was completed on schedule at a cost of approximately $2,750,000, money for which was provided as needed by long term credits. Construction of a third unit is now under way and should be completed early this fall, it was further stated.

Second Major Step in Program

"The completion of the new unit at Savannah is the second major step in our program of self-sufficiency in the matter of our pulp requirements," Mr. Calder said. "When our third Savannah unit goes into production in the fall, we shall be practically independent of outside sources of either kraft pulp or kraft paper at a saving to us of approximately $3,000,000 annually on today's market. It was originally estimated that each unit at Savannah would afford the company savings of approximately $1,000,000 a year. The operation of the first unit to date has amply justified this forecast.

Reliable Supply of Necessary Pulp

"Completion of the third unit will also assure us of a reliable supply of necessary pulp to meet the steadily increasing demand and range of usage for kraft pulp and kraft paper. We will also have ample kraft production to again solicit orders in the wrapping paper market," Mr. Calder said.

New Firm To Start Oconto Falls Mill

[FROM OUR REGULAR CORRESPONDENT]

Appleton, Wis., June 21, 1937—Purchase of the Continental Paper and Bag Corporation's mill properties at Oconto Falls, Wis., by a new corporation to be known as the Falls Pulp and Paper Company was announced last week. The company has begun repairs and adjustments, and expects to have the ground wood and sulphite mills in operation soon.

Clayton Ewing of Menasha, Wis., has been appointed general manager, and has taken charge of operations. Edward W. Forkin of Menasha, an attorney, also is a member of the new firm.

Except for the ground wood mill, the properties have been idle since July 1, 1930. The paper mill has two Fourdriniers of 82- and 108-inch width, and there are sulphite, sulphate and ground wood pulp mills.

When announcement was made that operations would be resumed, a community celebration was held. Bands paraded and a mass meeting was held at which Mayor E. J. Shellman spoke and introduced Mr. Ewing and Mr. Forkin. The mills formerly employed 350 men, most of whom are expecting to be restored to employment.

Union Bag Dismantles Kaukauna Mill

[FROM OUR REGULAR CORRESPONDENT]

Appleton, Wis., June 21, 1937—Finishing machines of the Union Bag and Paper Company's mill at Kaukauna, Wis., are being dismantled and moved to the Union Bag mill at Hudson Falls, N. Y., according to Karl Karlson, resident manager. Files and office records also will be moved there.

The paper machines will be left intact for the time being until the company decides what final disposition will be made of the Kaukauna property.

Operation of the mill ceased Wednesday, June 16, and it is believed the shutdown will be permanent. In a letter sent to each employee, Alexander Calder, president, explained that the mill had been operated at a loss for several years, and that an exhaustive study either as to products that could be made at a profit or modernization proved so negative the company decided to close the mill entirely. All of the workers were paid up to Saturday, June 19. More than 100 are affected by the shutdown.

The office force will remain at work until Saturday, June 26, closing up the books and preparing to ship the files and records.

Work Is Rushed On Big Mill at Bay Comeau

Between 4,000 and 5,000 Men Are Engaged In Construction Work of the Newsprint Plant of Ontario Paper Co. — Price Bros. Sell Large Timber Limits—Newsprint Reaches New High—Germany Uses More Old Paper.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., June 21, 1937—A group of newspapermen who paid a visit to Comeau Bay a few days ago, report that warehouses, machine shops and homes are rising like magic in the new newsprint manufacturing community which is being established on the lower St. Lawrence by the Ontario Paper Company, subsidiary of the *Chicago Tribune* and *New York Daily News*. The mill under construction will have a capacity of 350 tons of newsprint per day and the power plant being built in connection therewith on the Outardes River, will supply 60,000 b. h. p. hydro-electricity. The output of the mill will be shipped by water to New York for the use of the *New York Daily News*.

Construction work on the townsite, mill site and power development is slightly ahead of schedule. Gangs of men are already in the woods cutting the logs that will go down the flume to the mill. Roads are being hacked out of the wilderness, houses are being erected, the foundations of a Hudson Bay Company's department store have been laid, and a church, presbytery and community hall will be erected this summer. Both a standard gauge and a narrow gauge railway are being built, as is also the flume.

Between 4000 and 5000 men are at work in all, and the commencement of the production of newsprint has been fixed for June 8, 1938.

An interesting incident during the visit of the newspapermen was that on the Outardes river they witnessed the last portage of a band of Indians, returning from their hunting grounds north. They carried heavy packs and canoes, men and squaws alike, and their season's fur catch. Bands of birch-bark were wrapped around their foreheads to prevent the straps of their packbags from chafing. They were of the Montagnais tribe at Bersimis, Indians who every spring go north to the hunting grounds.

Sale of Big Timber Limits

From Quebec it is announced that Price Brothers & Co., have sold a stretch of timber limits covering 1,000 square miles at Sault au Cochon, Charlevoix County, to the Anglo-Canadian Pulp and Paper Mills for $1,250,000.

Anglo-Canadian, according to terms of sale, acquire exclusive rights to all building property on the limits in addition to water courses. Price Bros. had been in possession of the North Shore limits for a number of years but never had exploited the territory.

G. B. Elwin, treasurer, and A. M. Knill, secretary, represented Price Bros. while Frank W. Clarke, vice-president, and G. H. Bridge, acted for Anglo-Canadian in the negotiations and sale.

New High Record in Newsprint Production

A new high record in the production of newsprint in Canada was established for the month of May, when the output amounted to 309,232 tons. Previous high was reached in March, when production totalled 301,110 tons. May shipments totalled 311,883 tons United States production in May totalled 79,003 tons, against 75,719 tons a year ago. Newfoundland produced 29,962 tons during the month, to make a total North American output of 418,197 tons, an increase of 13 per cent over last May's 370,387 tons. These figures have just been issued by the News Print Service Bureau, New York. In the five months ended May, Canadian mills produced 1,471,912 tons, as compared with 1,219,212 tons a year ago, an increase of 20.7 per cent.

Use of Old Paper in Germany

The Canadian Trade Commissioner at Hamburg reports that with the increasing use of wood pulp in the German textile industry a shortage of pulp for the manufacture of paper has developed. This has caused added attention to be paid to the reclamation and reprocessing of waste and used paper and paper products. Of the total German paper production of about 3,000,000 tons, more than three-quarters are wasted through burning or some other form of destruction. The remaining 25 per cent, which is close to 700,000 tons, is of importance, however, and is reworked into various grades of paper and cardboard. Every effort is now being made to greatly increase this proportion which is reclaimed and concurrently to economize in the use of paper in general.

In addition to the old paper obtained in Germany, some 40,000 tons are imported from abroad, the better qualities chiefly from Western Europe. There is a particular demand for English paper because it is comparatively free of wood. The export of the finished product is much larger in volume and, in the case of the largest German producer, about 20 percent of the total production is sent abroad. Paper for packing is exported to Holland and other Western countries; the cheaper products are sent to the Balkan States and to the Near and Far East. Although competition has been very keen for many years, prices have risen of late, as there has been an increased drama which has facilitated exports.

Bamboo Pulp From Trinidad

From Port of Spain, Trinidad, it is reported that the British West Indies have joined the paper and pulp exporting countries with the first large shipment of locally-made pulp to an English firm for finishing.

The pulp was made from bamboo in a factory erected by a firm of English publishers. When the mill is operating in full capacity, an annual output of about 5,000 tons is expected.

Blandin Paper Co. Discontinues Office

ST. PAUL, Mo., June 21—The Blandin Paper Company announce that the sales and service office maintained in St. Paul will be discontinued as of June 21, 1937. It is requested that in the future all correspondence be addressed to the Blandin Paper Company, Grand Rapids, Mich.

Organize More Locals In Wisconsin Mills

Activity Is Especially Prevalent At Stevens Point — District Meeting Is Held At Kaukauna To Compare Wage Agreements—Commissioner Scouts Idea That South Will Soon Become Center of the Paper Industry.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., June 21, 1937—Further steps by unions of the American Federation of Labor to organize locals in the paper mills for collective bargaining are being taken in Wisconsin mills. Activity is prevalent at Stevens Point, Wis., where meetings are being held by employees of the Wisconsin River Paper and Pulp Company and the Whiting-Plover Paper Company. They are being assisted by Local No. 116 of the International Brotherhood of Papermakers, and Local No. 58 of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers. These two unions embrace employees of the Consolidated Water Power and Paper Company at the Stevens Point mill. The workers in the other two mills intend to organize separate locals so they can deal with problems in their own firms.

Meeting Being Held Elsewhere

Meetings also are being held among employees of the Marinette and Menominee Paper Company and the Victory Bag Company of Marinette, Wis., but no definite organization steps have been announced.

Efforts also are being made by the A. F. of L. unions and the Wisconsin Federation of Labor to prevent recognition of the newly formed independent union of employees of the Nekoosa-Edwards Paper Company, Nekoosa, Wis. The union, claiming 200 members out of 1,050 employees, has applied to the Wisconsin Labor Relations Board for recognition as a bargaining agent. The protest was made to the board by Raymond A. Richards of Wisconsin Rapids, Wis., vice-president of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers, who declared the group to be "Nothing more or less than another company union." He said three A. F. of L. paper workers' groups have been organized among Nekoosa-Edwards employees within recent weeks.

Hold District Meeting at Kaukauna

A district meeting of 40 delegates of pulp and papermakers' unions of Wisconsin and Upper Michigan was held Sunday, June 13, at Kaukauna, Wis. to compare wage agreements and discuss job classifications. Conferences were held during the morning and afternoon, and a banquet was held in the evening at the pavilion at Combined Locks, Wis., with 160 attending.

W. F. Ashe, personnel director of the Thilmany Pulp and Paper Company, Kaukauna, was the principal speaker. The Thilmany mill has a closed shop agreement, signed for the first time this year. He quoted the first clause of the agreement in which "it is recognized to be the duty of the company and employees to cooperate" for advancement of better working conditions and economic progress. "This calls for the first time for a partnership arrangement between both parties," he said. "Why? Because we want unions to live. But if they are to live, there are many things which must be watched."

Among these he cited distrust and jealousy within a union; consolidating its position and making itself so useful that under no conditions would the company want to see it die; ability to stand prosperity, and avoidance of too much political help and too much government.

Charles Seaborne, Thilmany's general superintendent, also spoke briefly emphasizing the advantage of friendly relations and discussion between employer and worker.

Jack Sharkey of Wisconsin Rapids, Wis., was elected president of the conference; Alex Schoen, Green Bay, Wis., first vice-president; Enor Beck, Escanaba, Mich., second vice-president; K. W. Winters, Wausau, Wis., secretary-treasurer, and Lawrence Bouche, Kaukauna, Wis., sergeant-at-arms.

The next conference will be held Sunday, August 29, at either Mosinee or Green Bay, Wis. A dance and a floor show followed the banquet.

Future of South as Papermaking Center

An article published in a bulletin of the Wisconsin Conservation Commission by John F. Preston of Washington, D. C., head of the forestry work for soil conservation service scouts the idea that the south will soon become the center of the American papermaking industry. He said that while millions of acres of pine in the southern states furnish the basis for the claim, it is necessary to select only pine without heartwood for white paper making. It is agreed that southern pine grows twice as fast as northern spruce. "There is no question about the large area of timber growing land down South," he writes. "The present stand of timber is, however, disappointingly light with very considerable areas of denuded and waste land. Everywhere fires burn through the woods year after year, and it is surprising to find that any forest can survive such treatment.

"There is no shortage of hardwoods for pulpwood, north or south, or prospective demands for pulpwood; it is only the soft-woods that are really important.

"Although it is possible to grow very much larger volumes of southern pine timber than are now growing, it seems improbable that the transformation can be brought about within several generations."

Dr. Rowland Speaks at Minneapolis

Dr. Ben Wright Rowland, research associate at the Institute of Paper Chemistry, Appleton, Wis., was a member by invitation of the group speaking last week before the National Colloid Symposium at the University of Minnesota at Minneapolis. He presented a paper entitled "Colloid Chemistry in Paper Making," dealing with types of fundamental investigation in the colloid field such as is undertaken in the study of paper making by such agencies as the Institute of Paper Chemistry. As a graduate student, Dr. Rowland delivered a paper before the first colloid symposium ever held, at Madison, Wis. in 1925.

Philadelphia Paper Men Have Annual Outing

Hold Games On Grounds of Manufacturers Club At Oreland, Pa. — George K. Hooper, Former President of the Philadelphia Paper and Cordage Association Presides At Dinner—Waste Paper Men To Hold Outing.

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., June 21, 1937—With nature all attuned and skies smiling their best smiles, upwards of 225 members and their guests got off to a good start at the annual outing of the Philadelphia Paper and Cordage Association on the spacious grounds of the Manufacturers Club at Oreland, Pa., on Tuesday of last week.

Golf, tennis and quoits were the order of the day. Fifty-four teed off for golf, and the winners were: Low Gross—tied by George Hoffner of S. Walter, Inc. and L. A. O'Neill of Paper Manufacturers Company, Inc.—both having scores of 81. They matched off and Mr. Hoffner won the match, the prize being a handsome silver cup, presented by the Schuylkill Paper Company. Low Net, was won by J. C. Shaw. First Prize—Kickers Handicap, won by R. S. Reed of Quaker City Paper Company; Second Prize was won by Mr. Dee; Third Prize—won by T. W. Monteith of J. E. Fricke Company and Fourth Prize was won by Mr. Murray. In the Putting Contest, First Prize went to G. H. Batchelder and Second to A. Brozius of Satterthwaite-Cobaugh Company. In Quoits—First Prize was won by Ray Hunter and Second Prize went to George K. Hooper, president, Hooper Paper and Twine Company. In Tennis—First Prize was won by H. H. Lott of G. H. Batchelder Company, and Second Prize went to J. J. Shinners, Jr. of Acme Specialty Sales Company.

Geo. K. Hooper Presides

The outing was climaxed by a dinner at 6 o'clock. Owing to the absence of President E. K. Lay, who was serving as delegate from Pennsylvania Society's Color Guard at the triennial convention of the National Society of Sons of the Revolution, which was in session 3 days in New York, former president George K. Hooper presided. Mr. Hooper read a telegram from Mr. Lay in which he expressed his regrets in not being able to attend, but assured them he was with them in spirit. After stressing the value of membership in the Association, Mr. Hooper thanked all those present for the splendid comaraderie manifested, and conferred the honor of announcing scores and awarding prizes upon Jack B. Shinners, Jr., and Arthur B. Sherrill. Mr. Shinners paid tribute to all the members and made special mention of Vincent A. Dirvin, Paper Manufacturers Company, Inc., Leonard Fitzgerald, Philadelphia representative of Schmidt & Ault Paper Company, York, Pa., Frank T. Hufnal, Huff Paper Company, Ralph Matthias, Matthias Paper Corporation, and Sam Shyrock, Shyrock Brothers, through whose untiring efforts the maximum of cooperation made possible the unprecedented success of the outing. The honor of awarding the prizes was accorded Arthur B. Sherrill, who gave a splendid impromptu talk during which he made a motion that the ladies be invited to attend the Association's Outing in the future. Harry S. Platt of Denney Tag Company, chairman of the Publicity Committee and immediate past president of the Association, said there were no "sit-downers" in the entire membership, a fact which was reflected in the diversified program presented. Mr. Platt's co-workers on the Publicity Committee were Otto Renner, Jr., Renner Advertisers, and J. R. Howarth, J. R. Howarth Paper Company. E. L. Richards, chairman of the Golf Committee, thanked F. W. Hastings, American Writing Paper Company, Arthur B. Sherrill, mill representative and T. H. B. Smythe, of J. L. N. Smythe Company, who were his associates on this committee.

Ladies in Attendance

The ladies who graced the occasion with their presence were Doris E. Lewis, executive secretary, Paper Trade Association of Philadelphia; Mary T. Schnepp, Audrey Townsend, Agnes Brown, guests of Arthur Sherrill, and Katherine H. Norman, PAPER TRADE JOURNAL.

A four-piece orchestra furnished music for the occasion, and during several selections, George K. Hooper gave a splendid demonstration of his mastery with the taps.

Howard Satterthwaite, chairman of the Membership Committee, Fred I. Brower, Atlantic Gummed Tape Corporation and director of the association, together with Lee Johnson, manager of Coarse Paper Department of D. L. Ward Company, and H. H. Lotts, assistant sales manager of G. H. Batchelder, with their rare baritone voices, rendered vocal selections which might well nigh make Nelson Eddy look to his laurels.

Waste Paper Men to Have Outing

Over the signature of John Beitchman, chairman of the Outing Committee of the Philadelphia Waste Paper Merchants' Association, announcement has been received by those in the trade here, that the annual outing of the Association will take place at Melrose Country Club, Elkins Park, on Thursday, July 15. Considerable time and effort are being spent to make this the outstanding affair in the annals of the Association. Rain or shine, the outing will be held as the Clubhouse affords wonderful facilities should there be any inclemency in the weather. All are urged to attend irrespective of weather conditions. Members are requested to bring as many guests as they wish including non-members of the Association and especially out-of-town dealers. The cost will be $3.00 and will include luncheon and dinner, prizes—and free beer will be served all afternoon and evening. Reservations are requested to be sent to Mr. Beitchman, 234 Queen Street, Philadelphia, not later than July 8.

Pacific TAPPI Meets at Vancouver, B. C.

Joint Session Is Held With Pacific Division of the American Pulp and Paper Mill Superintendents Association — George McGregor, of Longview, Is Elected Chairman of Pacific Section of Technical Association.

The Pacific Section of the Technical Association of the Pulp and Paper Industry met jointly with the Pacific Division of the American Pulp and Paper Mill Superintendents Association at Vancouver, B. C. on June 11 and 12, 1937.

The program was started Friday afternoon with a golf tournament, and Friday evening there was a get-together for the purpose of acquainting the various delegates with Vancouver hospitality. The technical program started Saturday morning with Ray C. Onkels acting as chairman. Mr. Onkels is the chairman of the Pacific Coast Division of the American Pulp and Paper Mills Superintendents Association. The papers were read by J. D. Rue, Hooker Electro-Chemical Company on "Recent Trends in Pulp Bleaching;" Andreas Christensen, British Columbia Pulp & Paper Co. Ltd., on the "Trend in Sulphite Pulping;" W. S. Kirkpatrick, assistant superintendent, Consolidated Mining and Filter Company, on "Recovery of Sulphur from Waste Smelter Gases." These papers were followed by a short business meeting for the TAPPI members. They then adjourned to a luncheon for the two associations.

Tribute to Kenneth Shibley

Earl Thompson paid tribute to Mr. Kenneth Shibley who passed away the first of last May. Mr. Shibley had taken an active interest in the Technical Association since the time of its conception on the Pacific Coast. He was well known in the Pulp and Paper Industries, particularly through his work on the water purification plants in the various mills. Mr. Shibley will be distinctly missed by his many friends in the industry.

Round Table Conferences

The luncheon was closed with a picture depicting the story of "Micarta" presented by the Westinghouse Electric Manufacturing Company. In the afternoon a very interesting and spirited discussion was held at the round table. Carl Fahlstrom and Ray Onkels led this discussion. The subjects covered were problems peculiar to present bleaching touching on the use of caustic soda extraction and time and temperature of the various stages. Cooking problems, particularly the materials for construction of circulating lines, and the problems of keeping these lines clear from scale, the resulting pulps and characteristics from green versus seasoned woods, also the relative pitch trouble attendant the use of these two types of woods, the agitation of stock chests and the necessary power required to accomplish real blending, the ideal crown for press rolls.

This meeting was closed at 4:00 p. m. The meetings reconvened at 6:30 for cocktail hour and banquet. Robert Bell Irving of the Power River Company acted as toastmaster. The Honorable A. Wells Gray, Minister of Lands for British Columbia, guest speaker, gave a very interesting discussion of the problems of the day. The banquet was followed by dancing and entertainment for the rest of the evening. Credit for one of our most successful meetings was due to Mr. Ray Onkels and Mr. Andreas Christensen, and everyone was unanimous in giving them praise.

New TAPPI Section Officers

At the business meeting new officers were elected for the Pacific Section of TAPPI. Mr. George McGregor, Technical Director of the Pulp Division, Weyerhaeuser Timber at Longview was elected Chairman. Mr. N. W. Coster, Technical Director for Soundview Pulp Company at Everett, Vice Chairman. Mr. J. V. B. Cox, Plant Superintendent for the Paper Maker's Chemical Division of Hercules Powder Company at Portland was elected Secretary-Treasurer. Mr. W. R. Barber, Technical Supervisor of the Crown Willamette Paper Company at Camas was elected Director, and Carl Fahlstrom, Technical Supervisor of the Longview Fiber Company at Longview was held as Director because he was outgoing Chairman.

Those Who Attended

Among those present were:

Mr. and Mrs. L. Killam, Mr. and Mrs. A. E. Baker, Mr. and Mrs. Andreas Christensen, Evan Whitehead, Mr. and Mrs. T. J. Sharland, Mr. and Mrs. G. D. Humphrey, O. A. Jorgenson and Victor Warren, B. C. Pulp and Paper Company, Ltd., Vancouver, B. C.; C. H. E. Williams, C. H. E. Williams Company, Vancouver, B. C.; Mr. and Mrs. John D. Rue, Hooker Electro-Chemical Company, Niagara Falls, N. Y.; Mr. and Mrs. M. W. Thorn, Sydney Roofing and Paper Company, Victoria, B. C.; H. A. Vernet, A. E. Stationery Manufacturing Company, San Francisco; Harold S. Muckelt, B. C. Equipment Company, Vancouver, B. C.; William R. Willets, Titanium Pigment Corporation, New York City; Mr. and Mrs. R. E. Chase, R. E. Chase & Company, Mr. and Mrs. A. S. Viger, Rainier Pulp & Paper Company, Albert Hooker and George W. Houk, Hooker Electro-Chemical Company, Tacoma, Wash.; Mr. and Mrs. J. E. Hassler, Coast Manufacturing and Sales Company, Portland; Mr. and Mrs. R. S. Carey, National Aniline and Chemical Company, Portland; Frank D. Wilson, Simonds Canada Saw Company, Vancouver, B. C.; Mr. and Mrs. G. H. McGregor, Weyerhaeuser Pulp Company, Longview, Wash.; Mr. and Mrs. W. P. Ferguson and J. A. Paget, Peacock Brothers Ltd., Vancouver, Mr. and Mrs. Irving R. Gard, Merrick Scale Manufacturing Company, Seattle, Wash.; Walter R. Baumann, Pennsylvania Salt Company, Tacoma, Wash.; Fred Shanemen, Pennsylvania Salt Manufacturing Company, Tacoma, Wash.; Mr. and Mrs. C. P. Kelly, Pacific Mills, Ltd., Ocean Falls, B. C.

T. M. Shields, Simonds Saw and Steel Company, Seattle, Wash.; A. C. Durham, Lockport Felt Co.,

Newfane, N. Y.; L. C. Kelley and S. H. Rudkin, B. C. Pulp and Paper Company, Woodfibre, B. C.; Z. A. Wise, Griffith Rubber Mills, Portland, Ore.; Mr. and Mrs. Earl S. Thompson, Great Western Electro-Chemical Company, Seattle, Wash.; J. D. Smith, Great Western Electro-Chemical Company, San Francisco; J. D. Fraser, Standard Oil Company of B. C., Vancouver, B. C.; E. S. Duval, Columbia Steel Company, San Francisco; N. L. Peck, Columbia Steel Company, Portland, Ore.; R. S. Niccolls, Columbia Steel Company, Seattle, Wash.; Mr. and Mrs. C. J. McAllister, Coast Manufacturing and Sales Company, Portland, Ore ; T. A. Graham, Columbia Steel Company, San Francisco; Howard C. Graham, Washington Pulp and Paper Company, Port Angeles, Wash.; Edward A. Heiss, Wallace Tiernan Company, Seattle, Wash.; W. R. Payne, B. C. Pulp and Paper Company, Woodfibre, B. C.; Lawrence K. Smith, *Pacific Pulp and Paper Industry*, Seattle, Wash.; R. S. Parry, Chess Bros. Ltd., Vancouver, B. C.; J. Iversen, Port Mellon Opr. Company., Port Mellon, B. C.; Mr. and Mrs. A. C. R. Yuill, Dominion Engineering Company Ltd., Vancouver, B. C.; Mr. and Mrs. R. C. Onkels, Westminster Paper Company, New Westminster; Mr. and Mrs. R. T. Petrie, Bagley & Sewall Company, Portland, Ore.; Fred R. Riley and C. H. Carruthers, Powell River Company, Powell River, B. C.; Mr. and Mrs. J. B. Thompson and Mr. and Mrs. A. F. Frattinger, Canadian General Electric Company, Vancouver, B. C.; Mr. and Mrs. L. G. Harris, Pacific Mills Ltd., Ocean Falls, B. C.

D. L. Shirley, Link Belt Company, Portland, Ore.; F. B. Wetherill, Link-Belt Company, Vancouver, B. C.; H. M. Jones, Ohio Knife Company, Seattle, Wash.; Mr. and Mrs. P. J. Onkels, Pacific Coast Paper Mills, Bellingham, Wash.; Mr. and Mrs. Walter E. Hodges, Asten Hill Manufacturing Company, Ltd., Portland, Ore.; Mr. and Mrs. Leonard McMaster, Asten Hill Manufacturing Company Ltd., Philadelphia, Pa.; John St. Loomis, Heller & Merz, New York City; Mr. and Mrs. Wm. C. Marshall, Heller & Merz, Portland, Ore.; Mr. and Mrs. R. Foote, New Westminster Paper Company, New Westminster; Mr. and Mrs. N. A. Lewthwaite, National Paper Products, Port Townsend, Wash.; Mr. and Mrs. H. Scott, *Pacific Pulp and Paper Industry*, Seattle, Wash.; Mr. and Mrs. J. W. Pickham, The Bristol Company, Seattle, Wash.; Mr. and Mrs. Wm. R. Gibson, Shibley Company, Seattle, Wash.; A. E. Youngchild, Soundview Pulp Company, Everett, Wash.; Mr. and Mrs. Jerome Janecek and Mr. and Mrs. Myron W. Black, Inland Empire Paper Company, Millwood, Wash.; Miss Florence Skitch, Vancouver, B. C.; C. C. Macdonell, B. C. Pulp and Paper Company, Ltd., Woodfibre, B. C.; Gerald Alcorn and Lee Hill, Weyerhaeuser Timber Company, Everett, Wash.; Roy Shuji, Vancouver Paper Box Ltd., Vancouver, B. C.; Mr. and Mrs. C. P. Parker, Fafnir Bearing Company, Seattle, Wash.; Mr. and Mrs. Lester T. Graham, Link-Belt Company, Seattle, Wash.; Paul F. Lueth, Sumner Iron Works, Everett, Wash.; T. B. Horn, Corn Products Sales Company, Portland, Ore.; Mr. and Mrs. C. H. Belvin, Chromium Corporation of America, Portland, Ore.; Mr. and Mrs. A. Zimmerman, Pacific Strawboard Company, Longview, Wash.; Dr. W. L. Bushline, University of Washington, Seattle, Wash.

Dr. K. A. Kobe, University of Washington, Seattle, Wash.; Ray Smythe, Rice, Barton & Fales Company, Portland, Ore.; George G. Guild, Huntington Rubber Mills, Seattle, Wash.; Mr. and Mrs. A. H. Lundberg, Seattle, Wash.; J. V. B. Cox, Hercules Powder Company, Portland, Ore.; A. M. Mears, Pacific Coast Supply Company, Portland, Ore.; Dan Charles, Warwick Waslem, Seattle, Wash.; Mr. and Mrs. H. O. Cavin, St. Regis Kraft Company, Tacoma, Wash.; Jack Martin, Schorn Paint Manufacturing Company, Seattle, Wash.; M. Sykes, Portland, Ore.; L. Troedson, Portland, Ore.; Mr. and Mrs. W. M. Osborn, Hooker Electro-Chemical Company, Portland, Ore.; Mr. and Mrs. Berk Bannon and Miss Bannon, Western Gear Works, Seattle, Wash.; Mr. and Mrs. E. Ekholm, Puget Sound Pulp and Timber Company, Bellingham; Mr. and Mrs. W. A. Salmonson, Coast Manufacturing and Sales Company, Seattle, Wash.; R. E. Drane, St. Helen's Pulp and Paper Company, St. Helens, Ore.; G. H. Tiernan, Dunlop Rubber Company, Vancouver, B. C.; Mr. and Mrs. A. L. Quinn, Stebbins Engineering Company, Seattle, Wash.; Mr. and Mrs. Carl Fahlstrom, Longview Fibre Company, Longview, Wash.; Martin Breuer, Du Pont Company, San Francisco; A. B. Hunter, McLennan, McFeely & Prior, Vancouver, B. C.; Mr. and Mrs. C. T. Radcliffe, New Westminster Paper Company, New Westminster; R. A. Bremner and H. Richmond, Electric Steel Foundry Company, Portland, Ore.; Jack Hutchinson, B. C. Plumbing, Vancouver, B. C.; Tom Wright, B. C. Pulp and Paper Company Ltd., Vancouver, B. C.; F. Fields, Bank of Nova Scotia, Vancouver, B. C.

S. M. Bowen, McLennan, McFeely and Prior Ltd., Vancouver, B. C.; Frank Hedley, Canadian Westinghouse Company, Vancouver, B. C.; Jack Priestman, Vancouver, B. C.; G. W. Vennells, Railway and Power Engineering Corporation, Vancouver, B. C.; G. A. Donnelly, Railway and Power Engineering Corporation, Vancouver, B. C.; R. C. Hardy, Canadian General Electric Company, Vancouver, B. C.; R. S. MacPherson, Northern Metals and Engineering Company, Vancouver, B. C.; D. C. Morris, James Brinkley Company, Seattle, Wash.; Brian Shera, Pennsylvania Salt Manufacturing Company, Tacoma, Wash.; G. F. Mitchell, Hesse-Erstad Machinery Company, Portland, Ore.; Mr. and Mrs. Ralph Chatham, Fuel Economy Engineering Company, Seattle, Wash.; Ken B. Hall, Improved Machinery Company, Portland, Ore.; Mr. and Mrs. Niles Anderson, St. Regis Kraft Company, Tacoma, Wash.; John Bardsley, Powell River Company, Powell River, B. C.; Logan Mayhew, Sydney Roofing and Paper Company, Victoria, B. C.; Ferdinand Shmitz Jr., Pacific Car and Foundry Company, Seattle, Wash.; Mr. and Mrs. Sidney M. Collier, Soundview Pulp Company, Everett, Wash.; G. M. Warren, Cons. Mining and Smelting Company, Vancouver, B. C.; I. H. Andrews, Powell River Company, Powell River, B. C.; B. L. Kerns, Westinghouse Electric and Manufacturing Company, Seattle, Wash.; B. G. Cross, Can. Ingersoll Rand, Vancouver, B. C.; B. W. Sawyer, Foxboro Company, Portland, Ore.; Don H. Guild, Huntington Rubber Company, Seattle, Wash.; P. Sandwell, Sawford & Sandwell, Vancouver, B. C.; E. O. Ericsson, Puget Sound Pulp and Timber Company, Bellingham, Wash.; T. E. Moffitt, I. F. Laucks, Inc., Seattle, Wash.; J. B. Jones, General Petroleum Corporation, Everett, Wash.

Recent Developments in the Bleaching of Kraft*

By John D. Rue[1]

The bleaching of kraft has made remarkable strides during recent years. In this discussion I shall use the term kraft as synonymous with sulphate, although we are all aware that in reality there are noteworthy differences between kraft as made for brown papers and sulphate as produced for the highest grades of bleached pulps. The differences occur in the care used in selecting and preparing the wood for the digesters, in the details of the cooking process, in the wet room procedure, and in the characteristics of the pulps themselves. In fact, success in the production of the highest grades of bleached kraft can be attained only by careful attention to the requirements of every stage in the pulping operation from the forest to the bleachery as well as by the employment of correct methods in the bleachery itself.

Developments in the Pulp Mill

The requirements for cleanliness in the case of the brown paper products have been relatively low. The kraft process can with ease reduce wood of nearly all species and all conditions as regards age, decay, moisture content and freedom from bark. The natural result has been that little attention has been paid to conditions that will ensure a relatively high yield of pulp which at the same time contains a minimum of lignin, of shives or soft fiber bundles, of dirt specks and of those dyes which offer great resistance to the final whitening effect of the bleaching process.

For the highest grades of bleached kraft those conditions are vital, perhaps nearly as vital as in the case of high grade sulphite. The wood must be sound and contain a minimum of knots and other defects. It must be thoroughly barked. The chips should be uniform. The digester capacity should be such as to provide ample time for relatively slow rates of cooking at moderate temperatures otherwise the uniformity of impregnation and of pulping essential to the best grade of product will be lacking. The brown, washed pulp must be so thoroughly defibered that it can be passed through flat screens with relatively fine cut plates. Fiber bundles which reach the bleachery will not be completely chlorinated and may persist throughout the bleaching process as off-color particles.

Particles of dirt originating in the bark and knots, particles of iron dust or iron sulphite and those of incidental origin should as far as possible be removed by the fine screens supplemented by a well designed riffling system. The iron compounds will, of course, dissolve to a greater or less extent in the acid chlorination stage. The ferric iron readily attaches itself to the pulp and contributes a yellowish color impossible to remove by bleaching. It may even result in catalyzing the destruction of fiber strength during bleaching stages.

Of great importance to the successful bleaching of kraft to a high degree of brightness is the greatest possible removal of the characteristic brown dyes. These have been reported as belonging to the phlobotannins and their permanence is probably accentuated by reaction with the sulphur in the cooking process. They are fairly readily bleached to a light straw color but resist with great tenacity any further effort to brighten them. These dyes are somewhat soluble in alkali and their content in the pulp can be reduced by adjusting the ratios of caustic and water to wood in the digesters so that at the end of the digestion the quantity and concentration of caustic are relatively high and the concentration of the products of digestion relatively low. Such an adjustment of the cooking conditions results in a reduction, to some extent, in the output per digester. That fact together with the necessarily longer cooking periods requires the installation of a larger digester volume than is considered normal for conventional kraft.

Thorough washing of the brown stock is of vital importance for two reasons: first, it decreases the chlorine consumption; and second, it reduces the content of those dyes which are difficult to bleach.

Having prepared a well washed, thoroughly defibered pulp relatively clean and strong and uniform in quality we can proceed to the consideration of the processes encountered in the bleachery.

Basic Types of Bleaching Stages

The modern bleachery in a mill that produces a high white, high strength kraft contains several steps or stages in the process only a part of which may be considered bleaching in the older concept of the term. There are, in fact, three basic types of reactions which should be considered. If there are others they need not be discussed at this time.

Chlorination Stage

One stage is that of chlorination. Chlorine, either liquid or gas, is injected into the stock and immediately and very rapidly reacts primarily with the lignin with the liberation of hydrochloric acid. The products of the reaction are only sparingly soluble in water or in dilute acids but are somewhat more readily soluble in dilute alkali, particularly the caustic alkalis. Chlorine in the presence of water tends to react not only as a chlorinating agent but also as an oxidizing or bleaching agent. In strongly acid media, as in the chlorination of pulp, the initial reaction is predominantly chlorination so long as there are materials present to be chlorinated. There follows, after the rapid reaction of the first 2 or 3 minutes, a secondary reaction which proceeds at a relatively slow rate and results in a substantial brightening of the color of the pulp.

Progressively increasing the dosage of chlorine in the chlorination stage reduces the drasticity of the subsequent stages in the bleaching process essential to reaching the desired degree of brightness. The strength of the fully bleached product is progressively improved. That is true so long as the dosage is not

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* Presented at the joint meeting of the Pacific Section of TAPPI and the Pacific Division of the Superintendents Assn., Vancouver, B. C., June 11-12, 1937.

[1] Member TAPPI, Hooker Electrochemical Company, Niagara Falls, N. Y.

so large that excessive periods are required to exhaust the chlorine. If the required reaction period exceeds about an hour, improvement in the end product may be lacking. It is possible, however, to progress still further with the strength improvement by increasing the initial dosage provided the acid reaction period is terminated after 5 to 45 minutes by the addition of lime. At a pH in excess of 8 or 9 the residual unconsumed chlorine is converted to hypochlorite which may, without prejudice to the quality of the end product be allowed to continue the reaction for 1 or 1½ hours at temperatures not to exceed 30 deg. C. In either case, whether lime is added or not, the reaction products should be removed by thorough washing.

Caustic Extraction Stage

Another stage may be termed caustic extraction. The purpose of this stage is to remove as far as possible any of the characteristic dyes which still may remain in the pulp. There is a divergence of opinion as to the conditions which should be set up for this reaction. In fact, those conditions may be varied with advantage depending on the quality desired in the fully bleached product. It has been the writer's experience that for a paper making pulp of high strength and high brightness the temperature should be at least 60 deg. C. and the reaction period about one hour. From 1½ to 2 per cent of caustic soda is required, i.e., about 30 to 40 pounds per ton of pulp. The caustic extraction may if desired be made sufficiently drastic to increase materially the alpha content of the pulp.

Thorough washing at this point is essential otherwise the undesirable products will not be completely removed.

Bleaching Stage

A third stage is the hypochlorite bleach or the true bleaching stage. It is in this stage that the pulp is brought to the final color. The procedures followed are those with which the pulp industry is generally familiar. It may be well to emphasize, however, that it is very important to maintain a pH at least of 8 or 9 throughout the bleaching period otherwise there may be some deterioration in the physical as well as chemical properties of the bleached product.

Multistage Bleaching Processes

Various multistage bleaching processes can be built up by using one or more of each of the three basic stages just described. The simplest, of course, would be a three stage process using one of each of the basic stages and in the order already discussed, i.e. 1, chlorination (C). 2, caustic (N). 3, bleach (B), or in brief CNB.

For purposes of economy in the consumption of chemicals and in the interest of higher degrees of brightness additional stages may be desirable or even essential. As typical examples we may have CNB_1B_2 or C_1C_2NB or $C_1C_2NB_1B_2$. The caustic stage may follow C_1 or B_1 or may even be repeated after C_1, C_2 and B_1. Each additional stage as indicated will result in some modification in the quality of the product and will reduce the total consumption of chlorine. The specific combination and the number of stages will depend on the quality of product which the manufacturer sets up as his objective and on the market conditions which determine permissible costs of manufacture.

Regression of Color

Bleached kraft is notorious for the ease with which it tends to lose its brightness of color on drying and in storage. Three factors may be mentioned as contributing toward a stabilization of color or in other words toward a reduction of the tendency to regression. The first is very thorough washing at the end of each stage but especially at the end of the last stage. The other two factors have to do primarily with a conversion of the impurities into forms that can be more readily removed by washing. In the first place the hot caustic extraction is an essential means of making the brown dyes and also the chlorinated products more readily soluble. In the second place, the stock from the last bleaching stage should normally be distinctly alkaline and it is known that alkaline materials are difficult completely to remove from the fibers. It is desirable therefore after the last stage wash to adjust the pH of the stock to less than 7. The stock should then be allowed a soaking period and rewashed. Very small quantities of chlorine water serve very well for this adjustment of pH. The chlorine provides the acid and at the same time maintains a slight oxidizing reaction until the final products have been removed.

Semi-Bleaching Process

For the brighter semi-bleached shades, i.e., those equivalent, say to unbleached sulphite and a little brighter, a two stage chlorine-hypochlorite process is usually adequate. For the lower shades of manila a single stage of hypochloric produces a product of good strength and with equal or superior economy as compared with the two stage chlorine-hypochlorite. No fixed rules can be stated which will serve as a sure guide to the selection of the single, two, or more stage process. Each pulp and each manufacturing situation should be studied and the process selected accordingly.

The bleaching of kraft has been going on for 15 or 20 years both in north American and European countries. Except for 1 or 2 isolated cases, however, the products have until very recently been of relatively low color. By the end of the current year there will be at least seven large plants in the United States and Canada producing bleached kraft pulps of high quality and high brightness; two in Eastern Canada; one in the Lake States; three in the Southeast; and one on the Pacific Coast. Also there are on the American market the products of at least three European mills, which are going a long way toward setting a pace for the American manufacturers.

It is interesting to note that there has been a wide regional distribution in the development of this new and rapidly growing branch of the pulp industry.

Quality of Product

Representative products are not yet available from the newer mills in the United States. It may be safe to predict, however, that the pulps, while probably slightly inferior to bleached sulphites in brightness, will be superior to them in strength. The bleached kraft pulps will without doubt find many uses where superior strength will give them a preeminent position. A large portion of the bleached kraft however despite its slightly inferior color may be expected to compete directly and successfully with the bleached sulphites.

Financial News of Pulp and Paper Industry

Bond Holders Protective Committee of Brown Co. Expresses Opinion It Is Not Advisable To Formulate Plan of Reorganization At This Time — Mersey Paper Bonds Offered — Philip Carey To Pay 50 Cent Dividend.

New York Stock Exchange

High, Low and Last for the Week Ending June 23, 1937

	High	Low	Last
A. P. W. Paper Co.	7¼	7	7¼
Armstrong Cork Co.	62¼	59¾	62¼
Celotex Corp.	44¼	43	44
Celotex Corp., pf.	75½	75	75½
Certain-Teed Products Corp.	14	11½	13½
Certain-Teed Products Corp., pf.	56¾	48½	51
Champion Paper & Fibre Co.	60	58	60
Champion Paper & Fibre Co., pf.	109	108½	109
Congoleum Nairn Co.	36½	34½	36½
Container Corp. of Amer.	28½	27⅞	28
Continental-Diamond Fibre Co.	19¾	19	19¾
Crown Zellerbach Co.	18⅞	17½	18½
Crown Zellerbach Co., cum. pf.	98	97½	97½
Flintkote Co.	29½	26½	28
International Paper & Power (a)	18½	17⅜	18½
International Paper & Power (b)	14	11¾	13
International Paper & Power (c)	6⅞	6⅜	6⅞
International Paper & Power, pf.	104½	99⅝	104
Johns-Manville Corp.	125½	120	125½
Johns-Manville Corp., pf.	123¼	123¼	123¼
MacAndrews & Forbes	31	31	31
Masonite Corp.	51	50	50½
Mead Corp.	27	25	26¼
Mead Corp., pf.	95	95	95
Paraffine Companies, Inc.	65¼	65	65
Scott Paper Co.	40	39½	40
Sutherland Paper Co.	32½	32	32½
Union Bag & Paper Corp.	75¾	72	75½
United Paperboard Co.	10	9	9⅞
U. S. Gypsum Co.	108¾	105	108¾
U. S. Gypsum Co., pf.	162	161	162

New York Curb Exchange

High, Low and Last for the Week Ending June 23, 1937

	High	Low	Last
American Box Board Co.	20¼	19⅞	20
Brown Co., pf.	82	76	76
Great Northern Paper Co.	40½	39½	39½
St. Lawrence Corp.	12	12	12
St. Regis Paper Co.	8⅛	7¼	7¾
Taggart Corp.	10⅜	9½	10⅜

Urges More Time in Brown Plan

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., June 21, 1937—In a letter to holders of the $21,415,500 Brown Company, first mortgage bonds, the bondholders protective committee of which Charles Francis Adams is chairman, expresses the opinion that in spite of improved earnings thus far in the current fiscal year, "it is premature and not in the interests of the bondholders to consider or formulate a plan of reorganization at this time."

The letter emphasizes the importance of the recent appointment by the trustees in bankruptcy of the firm of Coverdale & Colpitts to conduct a survey with respect to the company's earning power, its rehabilitation needs, working capital requirements, timberlands and the desirability of expansion. Hardy S. Ferguson & Co., pulp and paper mill engineers, and a competent independent forester to be selected by the trustees, will be associated with Coverdale & Colpitts in this survey.

"The action of the trustees in recommending a survey and report was strongly supported by this committee," the committee states. "Without a comprehensive and unbiased survey and report . . . there appears to be no adequate basis upon which to develop a plan of reorganization or to test the fairness and soundness of any plan which may be proposed."

The consolidated profit and loss statement for the period from Dec. 1, 1936 to May 15, 1937, constituting the first 24 weeks of the current fiscal year shows a profit for the period of $1,773,536 before provision for depreciation, depletion, non-operating items and deferred interest, comparing with $421,868 earned in the corresponding period of the previous fiscal year. It is noted that a special study is being made to determine the amount which will finally be charged for depreciation during the present year.

"The results for any limited period may not be a true index for the year," the letter observes, "but in view of the definite progress now being made toward rehabilitating the earning power of the company, it is hoped that conditions will warrant proceeding with the development of a plan of reorganization when the survey and report are completed."

The committee, which now represents holders of approximately 45 per cent of the bonds, requests additional deposits in order to make its effort fully effective.

Mersey Paper Co. Bonds Are Offered

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., June 21, 1937—An offering has just been made here of $4,000,000 Mersey Paper Company, Limited, five per cent first mortgage bonds, maturing June 1, 1957. The proceeds will be used to retire capital loan incurred for a portion of the cost of construction of the company's plant and subsequent additions; to retire mortgages on timber limits and agreements of purchase, and for general corporate purposes.

Mersey's 100,000-ton newsprint mill at Liverpool, N. S., built in 1929, is one of only two newsprint mills located at tidewater on the Atlantic seaboard of North America. This location permits year-round transportation to New York and other tidewater centers in the eastern United States, as well as to overseas markets, and gives the company pronounced advantages as regards costs of delivery of newsprint and of receipt of raw materials. Production of the mill, with the exception of a small amount delivered to Nova Scotian publishers is shipped in the company's specially-designed newsprint carrier "Markland" (of 4,400 tons cargo capacity) to Atlantic coast ports and in chartered vessels to other export markets.

Philip Carey Mfg. Co. To Pay 50 Cents

[FROM OUR REGULAR CORRESPONDENT]

DAYTON, Ohio, June 21, 1937—Stockholders of the Philip Carey Manufacturing Company were notified June 15 that a quarterly dividend of 50 cents per common share would be paid June 30 to stock of record on June 19, and that regular quarterly payments of 1½ per cent on 6 per cent preferred and 1¼ per cent on a 5 per cent preferred issue would be made the same date.

Emulsified Lacquers and their Applications to Paper

By L. Jay Smith[1]

Paper and other porous materials can now be effectively coated by the use of a new finish which will not be absorbed by or stiffen the coated article, but will form a flexible, adherent and attractive surface. This material is a lacquer emulsion (emulsified lacquer).

Constitution and Properties of Emulsified Lacquer

A lacquer emulsion consists of an extremely viscous, dough-like lacquer base dispersed in a relatively small percentage of water. It has a very high solids film-forming content, and it also permits the use of nitrocellulose of much higher viscosity which, in turn, produces a film of even greater strength.

Lacquer emulsions can be applied by the ordinary shop methods, such as machine coating, spraying, brushing, dipping, or by swabbing, or by the use of a spreader blade known to some trades as a "slicker".

The cost of the emulsified lacquer will vary, naturally, with the formula. Usually, due to its high solids content, a ready-to-use emulsion will cost more per gallon than a corresponding solution type lacquer. Per pound of solids applied, however, it is very likely to cost less.

Frequently, less emulsion than ordinary lacquer is required for the same job. In place of the usual expensive solvent thinners used for lacquers, the emulsion can be thinned out with a very small quantity of water.

The writer does not hold that emulsified lacquer is a cure-all or that it will displace all other lacquers. It can, however, be used to finish many types of products which have in the past been considered unsuitable or uneconomical to finish, and in many cases, it will also improve the existing finish.

Almost any type of lacquer with the corect properties and merits for specific jobs can be adapted to emulsification for the following purposes:

1. To produce a finishing material that will permit the application of a heavy single coat.
2. To produce a surface coating that will not be absorbed by a porous material.

Advantages

Experience has shown that a much thicker coating of lacquer emulsion can be applied by the spray gun without sagging than is possible with the ordinary lacquer solution. A heavier coat may be applied in any application method principally because of the lighter solids content of the emulsion. The dry film from an emulsion will be heavier than the dried film from a usual lacquer of the same wet coat thickness.

Lacquer emulsions can be made in great variety. Formulae can be altered by blending a lacquer emulsion with an emulsion of another material, such as wax.

Lacquer emulsions of widely different properties can be blended to produce a final film equal to that of a solution composed of the combined ingredients. For example, it is possible to add resin solutions by stirring them into the emulsion. Wall board and papier mache which is to be covered with paint or varnish will absorb practically none of these materials if first given a light sizing coat of emulsified lacquer. Carefully selected dye solution may be added at the time of use, making possible a wide variety of colors from one base material.

By the use of emulsions, it is possible to apply a surface film upon material of extreme porosity. Take, as a case in point, blotting paper, which, if unsized, would readily absorb the usual lacquer solution.

The presence of water in emulsion does not imply that dried films from emulsified lacquers are different in any aspect from typical lacquer films. They possess gloss, flexibility and adhesion in ratio to the skill with which, like lacquers, they have been formulated.

The increased interest in easily disposable paper containers for the packaging of lubricating oil has developed a need for an oil resistant coating material. By finishing the interior of these containers with a fluid lacquer emulsion, a durable leak-proof coating is produced that allows the oil to drain more readily than from either metal or glass.

For paper or fiber board a much more open matte can be used and the usual sizing coats can be eliminated. Emulsion coated papers have shown themselves to be remarkably free from the tendency to block.

[1] Roxalin Flexible Lacquer Co., Inc., Elizabeth, N. J.

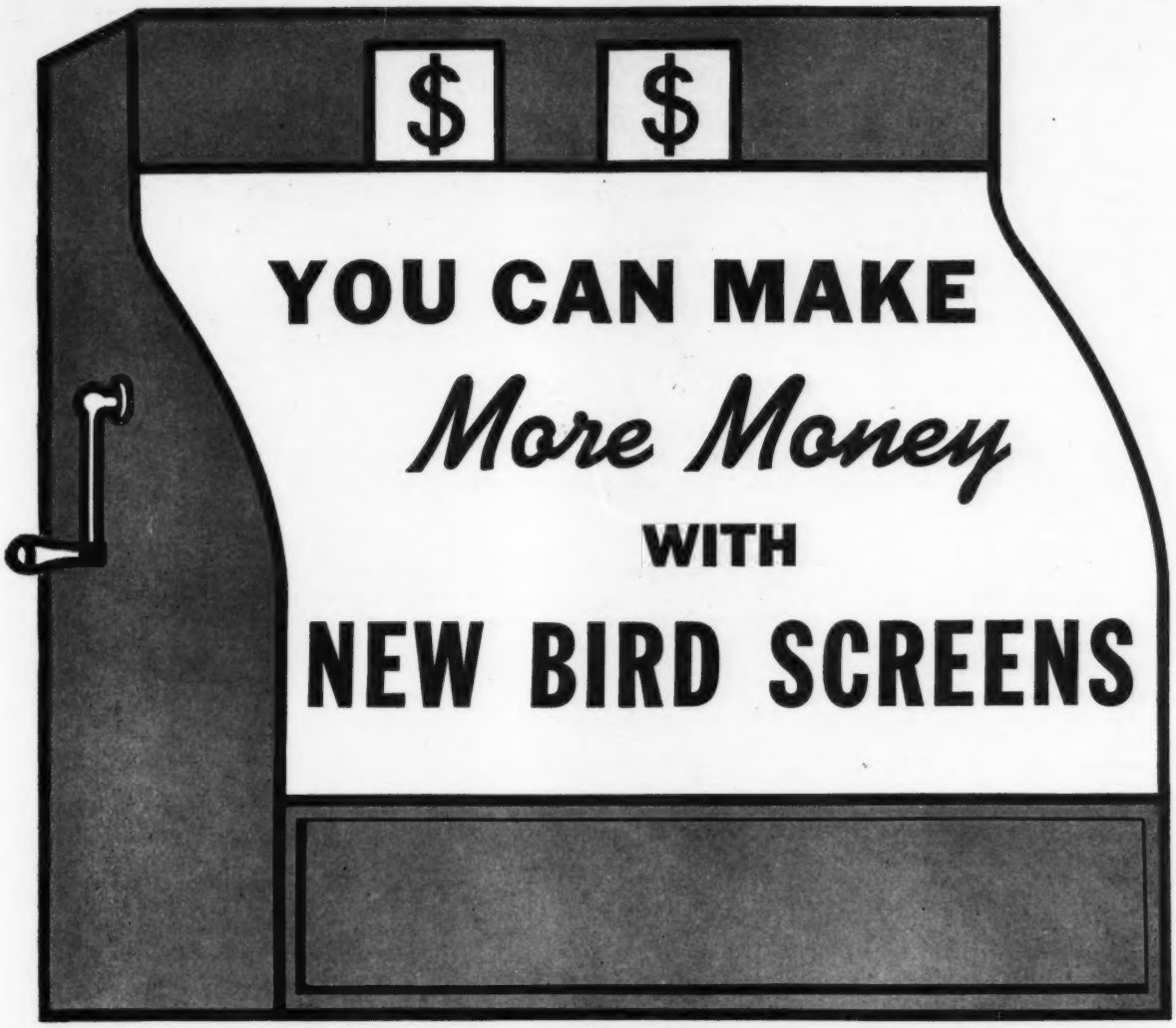
Brochure on Roofing and Siding

The subject of cutting maintenance costs on industrial roofing and siding is discussed in the new twelve page brochure, "J-M Corrugated Transite," published by Johns-Manville.

How Corrugated Transite can be applied by any average workman is explained with the help of a full page of drawings showing construction details. Also illustrated are the special patented accessories that seal all Corrugated Transite joints and ridges.

Typical installations pictured illustrate how this asbestos-cement has served without maintenance for many years as roofing and siding in industries where unusually severe corrosive conditions exist.

Copies are available free upon request to Johns-Manville, 22 East 40th street, New York City.



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Obituary

Alfred H. Sawyer

Alfred H. Sawyer, 70, president and chairman of the board of directors of the Middlesex Products Company, manufacturers of coated, glazed, plated, embossed and cloth lined papers at Cambridge, Mass., and president of the Judson L. Thomson Manufacturing Company, Waltham, Mass., died suddenly June 14 at the Charlesgate Hospital, Cambridge, Mass. His residence was at 17 Wood street, Concord, Mass.

A high ranking heating engineer, Mr. Sawyer was also prominent in Concord business and civic affairs. He served as a member of the Concord board of trade for many years.

Born in Concord, he was a son of Charles A. and Josephine J. Sawyer. After attending the schools of Concord, he entered the Massachusetts Institute of Technology where he was graduated as a heating engineer with the class of 1888. He was president of his class at M. I. T. He then entered the employ of the Sturtevant Blower Works in Hyde Park where he eventually became agent.

He left the Sturtevant Blower Works to become president of the Judson L. Thomson Manufacturing Company in Waltham, the office he held for the last twenty-five years.

He was a member of the Boston City Club, Engineers' Club, and Appalachian Mountain Club (past president), and the Concord Country Club. Unmarried, he leaves several cousins.

Funeral services were held in his late residence June 16 at 2 P. M. Burial was in Forest Hills Cemetery, Jamaica Plain, Mass.

Otto R. Karnheim

Otto R. Karnheim, 61, president of Stone & Forsyth Company, Boston, died at his home in Melrose, Mass., June 16, after a long period of ill health.

Mr. Karnheim entered the employ of Stone & Forsyth as a boy in 1891 and by gradual steps came to have charge of manufacturing in the company's folding box plant, located first in Boston, then in Stoneham, Mass., and since 1912 in Everett, Mass. In 1918, he was elected president of the company, which position he held until his death.

He is survived by his widow, two sons and two daughters. The eldest son, Charles F. Karnheim, succeeds his father as manager at the Everett factory.

Robert F. Droppleman

[FROM OUR REGULAR CORRESPONDENT]

DAYTON, Ohio, June 21, 1937—Robert F. Droppleman, president of the Standard Paper Company, 135 West Sixth street, Cincinnati, died June 15 at his residence, 1125 East Rookwood drive, Walnut Hills, following a brief illness.

He had been associated with the paper company for the last 33 years. He was born in Cincinnati, November 18, 1874, and was the son of the late Frank Droppleman, former executive of the Krippendorf-Dittman Shoe Company. He was a graduate of St. Xavier University.

He was prominent in the affairs of the Cincinnati Club, where he had been a familiar figure for years, and he also was a member of the Cincinnati Country Club. Always interested in the welfare of orphans, he was a life member of St. Aloysius Orphan Society of Cincinnati.

Surviving are his widow, Mrs. Mary Droppleman; a daughter, Mary Margaret; and a sister, Mrs. Joseph Ryan, all of Cincinnati.

Requiem high mass was sung at 10 A. M. Wednesday at St. Francis de Sales church. Interment was in Calvary Cemetery.

Bird Save-All Goes to Finland

The many friends in the American paper industry of Petter Larsen of Oslo, Norway, whose death recently was noted in the PAPER TRADE JOURNAL read with interest the following abstract from an article from the April issue of the *Stuff Box*, the house organ of the Bird Machine Company:—

The following quaintly expressed letter from Mr. Petter Larsen, a partner in the firm of Lorentzen and Wettre of Oslo, Norway, representatives of the Bird Machine Company in Norway, Sweden and Finland, is of more than passing interest not only because of its evidence that the worth of American paper machinery is recognized in the older paper making countries but because of its writer, rare and charming individual that he is.

He writes to Mr. Dennett, our president, from Helsingfors,

"My dear friend:

Today I feel myself happy to forward to you order for two of your Bird Save-Alls for Kymmene and Waika Paper Mills.

The Save-All you sold them before works absolutely fine. The Company is delighted and no more is needed to say. I will stay in Finland to 5 March and when warm I will make a special business for Save-All so if you let me have few of your electrotypes I shall be very thankful to you, good friend. After I have been so well confirmed about results as I am now I will start in with great energy like your Bird Screens for paper machines and I hope to be able to satisfy you greatly.

Well my friend everything is just exactly nicely for me now.

Yours,

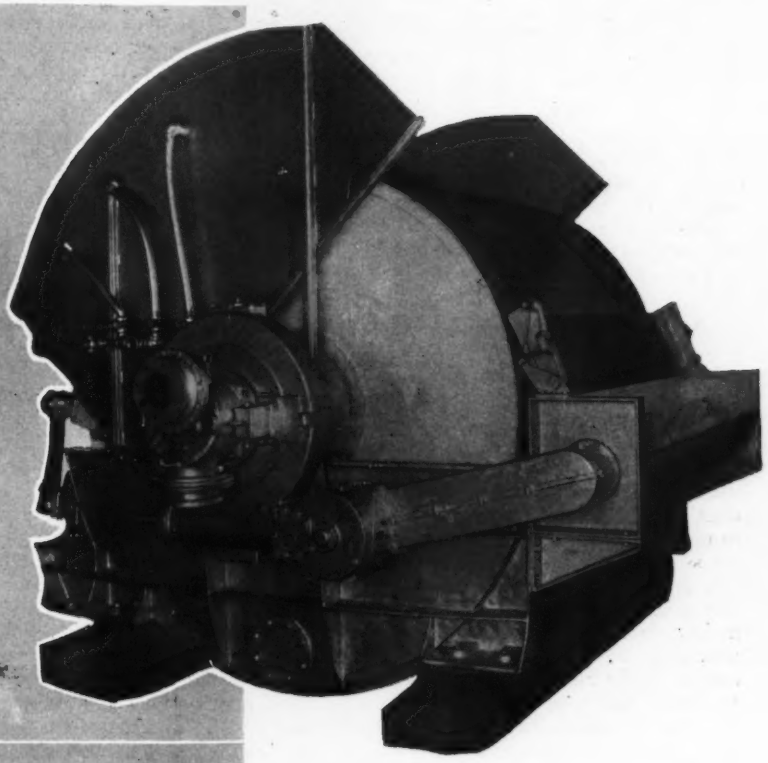
PETTER LARSEN."

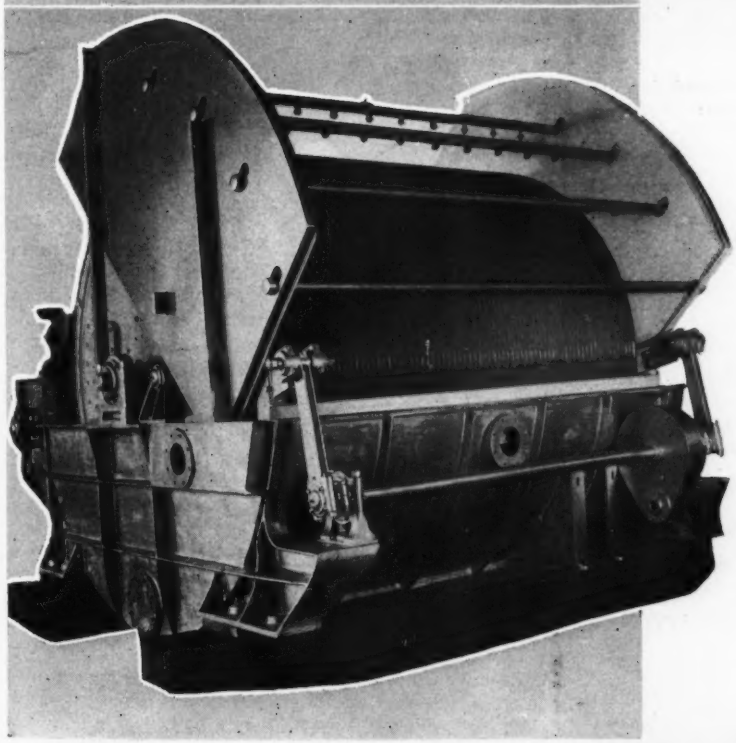
Start of the Gilbert Paper Co.

Pioneering efforts of the Gilbert Paper Company, Menasha, Wis., were revealed by T. M. Gilbert, treasurer, in an address last week before the Rotary Club of Menasha. The mill was founded by the late William Gilbert, Sr., who had formerly been associated with the late George A. Whiting in the paper company bearing the latter's name. The Gilbert mill was established in 1887 as a one-machine plant, and was the only rag mill west of Massachusetts. Later the company combined the use of rags with sulphite, pioneering in a field which was scoffed at by authorities of the day. The air drying process also was cited as a pioneer effort when steps were taken to double the capacity. The importance of the company's laboratory work was explained by Mr. Gilbert, who said a definite plan is being followed in anticipation of a new era in papermaking. The policy is one of strict adherence to every development for scientific improvement of the company's products.

IMPCO

LIME SLUDGE FILTERS





"Impco" Lime Sludge Filters are built in 5 and 8 foot diameters—all cast iron vats and mould, Monel winding wire and face. Totally enclosed drive, anti-friction bearings—swing agitator bearings not in contact with sludge.

Detailed information, engineering data and service are available to you without obligation. Write or wire.

IMPROVED PAPER MACHINERY CORPORATION

Nashua, New Hampshire

Four Mills Require 225,000 Cords

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., June 14, 1937.—Four important mills of the Fox River Valley, a local survey reveals, require annually about 225,000 cords of pulpwood, or, roughly 11,250 carloads. The mills are those of Kimberly-Clark Corporation at Kimberly, the Interlake of the Consolidated Water Power and Paper Company at Appleton, the Combined Locks Paper Company at Combined Locks, and the Thilmany Pulp and Paper Company at Kaukauna. They have tens of thousands of cords stacked in huge piles along the Fox river, and not a single log is more than about fifteen months old.

The annual demands of the Kimberly mill of the Kimberly-Clark Corporation, for example, would require a 40-mile trainload of logs—about 50 acres of timber a day. About half of this supply is cut in Ontario, Canada, floated down rivers into Lake Superior, and caught there in booms. The logs then are loaded on steamers, taken across the lake to Green Bay, and brought by rail to the mill. The corporation operates a dock at Green Bay where two cranes work 24 hours daily loading and unloading logs. Enlargement of the dock was completed a few days ago, so that it can now accommodate steamers 384 feet long. When pulpwood is piled at the Kimberly mill, a careful check is made to permit rotation of the supply on hand and use of wood which is properly seasoned to meet mill specifications. The corporation has some processes which require pitch green wood, and others in which seasoned wood is used.

The other half of the pulpwood purchased for the Kimberly mill is cut in Wisconsin, upper Michigan and Minnesota and brought directly to the mill by rail.

The Interlake mill in Appleton uses all spruce, all cut in Ontario and all brought through the Saulte, entirely by rail. Much of the wood used by the Consolidated company's mills at Wisconsin Rapids and Biron, however, is towed across Lake Superior to Ashland, Wis., in huge rafts containing as much as 12,000 cords. Company-owned tug boats haul the rafts across the lake. From Ashland shipments are made by rail to Wisconsin Rapids and Biron.

Pulpwood logs are dumped off railroad cars into a canal or pond at the Interlake and Combined Lock mills. The Interlake's canal is open except for the period from about December 15 to Feb. 15 each year. Workmen equipped with pikes shove the logs onto a conveyor that takes them into the mill. In addition to facilitating handling, the canal gives such logs as are still covered with bark a treatment that helps considerably in the subsequent "barking" process. About twenty carloads can be floated in the canal at one time.

During extremely cold weather a "hot pond" is kept open with exhaust steam. The Interlake also originated a plan, since adopted by a number of other mills, of operating a submerged conveyor into which bark-covered logs are taken for about twenty minutes to loosen the bark.

The Thilmany Pulp and Paper Company brings in the bulk of its pulpwood from upper Michigan, entirely by rail. Most of it is jack pine with some hemlock, cut into 100-inch lengths. The company does not carry a large stock of logs, the supply on hand ordinarily being sufficient for normal operations for about four months.

At the Combined Locks mill the supply would permit normal operations for about fifteen months. About two-thirds is cut in Northern Michigan and Wisconsin, the remaining third in Canada. The lake states logs are brought to the mill by rail, but the Canadian is shipped by combined water and rail routes.

Carter, Rice & Co. Have Outing

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., June 21, 1937—Approximately 125 of "The Stow-Aways" of Carter, Rice & Co., Corporation, including those from the Boston, Worcester, Providence and Springfield offices, had their third annual outing at the Stow Country Club, Stow, Mass., Saturday, June 19, and to say that everyone had a good time would be putting it mildly.

On arrival at the club about 10 o'clock, light refreshments were served. At 10:30, the sports program began, including a ball game, bowling, swimming, golf and tennis, lasting into the afternoon. A delicious dinner was served at 2 o'clock, followed by dancing and other interesting events, which lasted until a late hour. All the privileges of the club were open to the party throughout the day.

Committees were as follows:

GENERAL CHAIRMAN—Harold E. Jefferson.

SIGN-UP—Julia Barry, chairman, Henry McDonald, Lauretta McArthur, Ray MacDonald, George Joyce, Joe Dooley, Sally Rogers.

TRANSPORTATION—Millie Young, chairman, Gertrude Killoran, Bob Power, George Lewis, John Coleman, John Haggerty, Earle C. Booth.

PUBLICITY—John Wilson, chairman, Sam Hallbeck, Herb Osgood, Mae Coughlin, Joe Coleman, Sarah Hoban, Fred McLaughlin, Charlie Brann.

SPORTS—Ann Clyde, chairman, (Irving Canfield, originally appointed, being in New York State, was unable to serve), Bob Cushing, Jimmie Murphy, Marty Fitzpatrick, Chet Weidner, Dan Sullivan, Streeter Bush, Carolyn Low, Anne Clyde, Norma Bezanson, Ash Crowell, Frank Winter, Peg Redham, Esther Reed, Margaret Kelleher, Florence Leitch, Dick Hall, Monty MacDonald, Paul McGreenery, Dinty Meehan.

DANCE—Tom Ward, chairman, Mae Leary, Jessie Turner, Howard Fleming, George McLaughlin, Barbara Briggs, Joe McLaughlin, Paul Swett, Marie Dwyer, Catherine Connell.

PROPERTY—John Tucker.

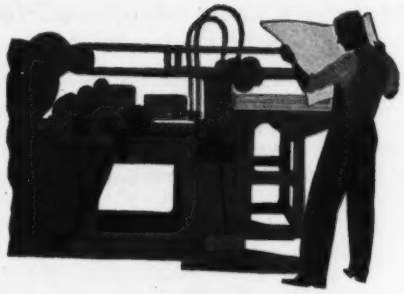
New Agents for Hurlbut Papers

The Hurlbut Paper Company announces the following new Hurlbut distributors:—

MOULD MADE COVER: The Central Ohio Paper Company, Columbus; the Central Ohio Paper Company, Dayton; Carpenter Paper Company, Grand Rapids; Columbia Paper Company, Ltd., Vancouver, B. C.; McFarlane, Son & Hodgson, Ltd., Montreal; Barton, Duer & Koch Company, Washington, D. C.; the Johnston Paper Company, Cincinnati.

CORTLEA: Beecher, Peck & Lewis Company, Detroit; Bermingham & Prosser Company, Kalamazoo; the Johnston Paper Company, Cincinnati.

SHADOWMOULD: Carpenter Paper Company, Grand Rapids; General Paper Company, Los Angeles.



LET'S FORGET QUALITY

Let's forget BETTER SPREAD AND FORMATION . . . assume your present formation is getting by satisfactorily.

Let's forget HIGHER UNIFORMITY OF CALIPER . . .

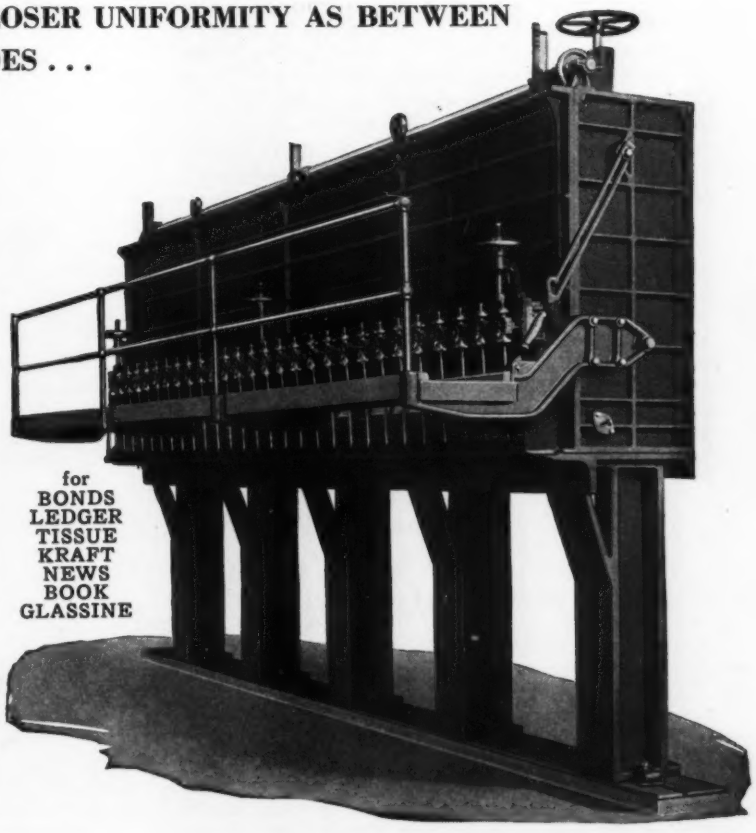
Let's forget IMPROVED FINISH . . .

Let's forget CLOSER UNIFORMITY AS BETWEEN THE TWO SIDES . . .

Let's forget QUALITY altogether and just talk straight dollars and cents. COST PER TON and nothing else!

The *quickest* and *easiest* way to reduce cost per ton is to hold present operating costs CONSTANT and INCREASE PRODUCTION. This can be done with a new, improved Valley Inlet. And with the experience of 450 Valley INSTALLATIONS as a background, we can tell you HOW MUCH the Valley Inlet can be expected to increase your production.

Take this short cut to bigger earnings. Write Valley for full details.



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KRAFT
NEWS
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Beaters • Jordans • Stock Inlets • Micro-Mist Spray Dampener • Pumps • Deckers
Screw Presses • Laboratory Equipment • Plug Valves • Flat and Rotary Screens
Vortex Beater • Automatic Felt Guide • Hypoid Gear Drive • Voith Kneader • Paper Marking Device

F. A. Soderberg Addresses Salesmen

F. A. Soderberg, of the General Dyestuffs Company, speaking at the meeting last week of the Salesmen's Association of the Paper Industry at the Framingham Rooms of the Hotel Lexington, New York, showed by charts how varying conditions in the water and chemicals used in paper making affect the amount of retention of dyestuffs. Variations sometimes as high as 75 per cent may occur, the speaker said.

"We have determined from practical observation that the rotation color-size-alum or size-color-alum gives the maximum strength of shade. The latter method is recommended when basic dyes are used since the size gives the fibre a protective coating which prevents the dyestuffs from striking and producing mottled fibres. Acid colors do not show such a marked difference in shade, however. Practically without exception basic and direct colors react in the manner indicated by these dyeings. Because each and every one of these dyestuffs are structurally different the reasons for their reactions are seldom the same. We have many colors which would be quite satisfactory for paper mill use were it not for the fact that changes in rotation would render them unfit.

"Hydration is not only important in the retention of color by the fibre but also due to the fact that an increase in depth becomes apparent due to light reflection. If you hydrate your stock in the beater, Jordan or machine chest for varying lengths of time, you may rest assured that the final results will not be very uniform. As we all know, there is a tendency in some mills to load the system with stock in the early morning hours and this, without a doubt, increases hydration with the resultant variations."

New Wage Agreement in Canada

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., June 21, 1937—Four of the largest pulp and paper manufacturing concerns in Quebec Province have answered the general appeal of the Provincial Government by entering into negotiations with their employees with a view to concluding collective labor contracts calling for wage increases estimated to run in excess of $1,500,000 annually.

The four companies are: Consolidated Paper Corporation, Ltd.; Price Brothers & Co.; Anglo-Canadian Pulp and Paper Mills; Lake St. John Power and Paper Company. They employ 5,650 workers, and committees representing the mills and the employees have now been discussing the contracts for some two weeks.

These companies and their employees have agreed to form a joint committee with a view to regulating their relations. The Provincial Minister of Labor, in making the announcement, expressed the view that through the functioning of the proposed joint committee the employers will no longer be menaced by strikes, since all questions relating to operation of this law will regularly be submitted to that body. He urged, moreover, that the action of the four companies be followed by all industries of Quebec Province—large and small. Expectations are voiced here that the remaining pulp and paper manufacturers in the province will follow suit in the near future.

New Papermaking Materials Present New Problems

According to the National Bureau of Standards, the development during the past several years of new types of fibers and mineral coating and filling materials has led to a number of problems formerly nonexistent. Writing and printing papers are classified commercially as to quality according to rag content, but now there are fibers produced by special refining treatments from wood and other fibrous materials, which have qualities similar in many respects to the various grades of rag fibers. For this reason the Bureau has recommended purity of paper fibers as a primary basis of classification for such papers. Improved wood fibers are supplanting to some extent the rope fibers used to make tough, durable paper for such products as tags and bags. To meet this situation, the fiber specification for jute tag paper purchased by the Government Printing Office has been changed to require a minimum amount of either rope fiber or super-purified wood fiber.

New developments in mineral filling and coating materials are the use of titanium oxide, zinc sulphide, calcium sulphite, and greatly increased use of chalk. The last three present complications in testing. When an inert material such as clay or titanium oxide is used, the ash of the paper is a satisfactory measure of the amount of filler or coating mineral present, but the other mineral materials partly volatilize in ashing the paper, therefore the original amount present must be calculated after the material has been identified by analytical tests. The copper number of paper, which is used as an index of its probable stability, cannot be determined if zinc sulphide is present. The presence of chalk complicates the use of fibers from repulped waste papers because it neutralizes alum used for beater sizing paper with rosin, with production of foam caused by liberated carbon dioxide gas.

New Hamilton Agents Announced

W. C. Hamilton & Sons, Miquon, Mont. Co., Pa., announce the following new Hamilton agents:

Old Treaty Bond—Charles W. Beers Company, Baltimore, Md.

Old Treaty Bond—Hobart Paper Company, Chicago, Ill.

Hamilton Andorra—Central Ohio Paper Company, Cleveland, Ohio.

Hamilton Opaque—Whitaker Paper Company, Detroit, Mich.

Hamilton Opaque—Moser Paper Company, Chicago, Ill.

Walker Goulard, Plehn Co. Win

Playing errorless ball behind nine hit pitching of F. Casselman, and combining fourteen hits with loose fielding on the part of the opposition, the team of Walker, Goulard Plehn Company decisively defeated the baseball team of Bulkley Dunton & Co. by a score of 15 to 2.

Batting stars of the victors were Hornby, J. Burke, and Burns.

Plans are being made to form a Baseball League among the paper merchants in New York City. Any firms who may care to enter teams will please communicate with H. Burke at 450 Pearl street.

To Have Paper Exhibit at Chicago

The National Paper Trade Association has arranged for an exhibit of wrapping paper and paper products and twine in connection with the semi-annual Convention to be held in Chicago at the Stevens Hotel, September 20 to 23, inclusive.

In the past many manufacturers have taken advantage of the opportunity offered by the convention to contact a large number of merchants and have had individual room exhibits. These exhibits, however, have been scattered over the entire hotel and there has been no attempt made to organize or correlate them in any way. The result has been that many merchants who might have desired to see these exhibits have found it impossible to do so and still attend the sessions of the National Paper Trade Association for which they came to the convention.

The present proposal will acquaint all merchants well in advance with the name, location and products of all exhibitors and will make it relatively easy for interested merchants to view all of the exhibits in which they are interested in much less time and still take advantage of the association meetings.

Exhibits of this type are not new—room exhibits have been held by many other national associations for years and the National Paper Trade Association has apparently taken advantage of the experience of other associations in setting up their plans and uniform regulations for orderly procedure and control.

It would appear that exhibits of this character would offer an unparalleled opportunity not only for merchants in the Midwest territory but for merchants' salesmen in this territory to get a broader picture of wrapping lines as well as a wider vision of the importance of the trade. It has been proposed that the last day of the exhibit be designated as salesmen's day and that an attempt be made to have special salesmen from all over the territory come in to Chicago on that day to view the exhibit.

This proposal is a progressive step from which both manufacturers and merchants should profit.

To Start Work on New Pulp Unit

BELLINGHAM, Wash., June 19, 1937—With the approval by the City Council of industrial water at rate contracts, the Puget Sound Pulp and Timber Company announced last week work will start within six weeks on the first unit of its expansion program involving some $2,500,000.

Manager Ralph M. Roberg said day and night construction shifts would be employed until probably March or April of next year.

The capacity of the new unit, combined with the present mill, will be about 240 tons of sheet pulp a day. The completed plant will employ about 400 men, Roberg said.

Danneker & Evans Take Over Lab.

Danneker & Evans of New Orleans, La., formerly associated with the F. W. Liepsner Laboratory before the death of Mr. Liepsner, have taken over that laboratory in the name of Danneker & Evans, as of May 1, 1937. The Joint Committee on Approved Pulp Testing Chemists has recognized their status in the trade as successors to the Liepsner Laboratory and granted them their approval, as of this date.

Government Paper Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 23, 1937 — The Government Printing Office has announced the following paper awards:

Barton, Duer & Koch Paper Company will furnish 520 pounds (2,000 sheets) of 26 x 40 buff antique cover paper at 5.15 cents, bids for which were received on June 7.

The Import Paper Committee will furnish 24,150 pounds of two sizes yellow sulphite manifold paper at 9 cents per pound, the Cauthorne Paper Company will furnish 83,750 pounds of white offset book paper at 6.349 cents per pound. Bids for these items were received on June 4.

The R. P. Andrews Paper Company will furnish 3,600 sheets of 20 x 25 blue gummed paper at $8.90 per M sheets, bids for which were received on June 2.

The Whitaker Paper Company will furnish 14,550 pounds (75,000 sheets) of 20 x 30 drumhead manila paper at 8.16 cents and the Whitaker Paper Company will furnish 10,000 sheets of 24 x 36 white cloth lined paper at $113.23 per M sheets, bids for which were received on May 28.

Barton, Duer & Koch will furnish 40,200 pounds of 38 x 48 M. F. book paper at 6.51 cents per pound.

The Printing Office has received the following bids for 60,000 pounds of wood bristol board: Barton, Duer & Koch Paper Company, at 5.15 cents; Old Dominion Paper Company, 5.22 cents; Reese & Reese, Inc., 5.23 cents; Marquette Paper Company, 4.87 cents; and R. P. Andrews Paper Company, 5.42 cents.

For 6,120 pounds (30,000 sheets) of green wood bristol: Barton, Duer & Koch Paper Company, 5.15 cents; Old Dominion Paper Company, 5.47 cents; Reese & Reese, Inc., 5.47 cents; Marquette Paper Company, 5.22 cents; and R. P. Andrews Paper Company, 5.42 cents.

For 80,000 pounds of supercalendered book paper: Stanford Paper Company, 6.11 cents; Dobler & Mudge, 6.11 cents; Barton, Duer & Koch Paper Company, 6.11 cents; R. P. Andrews Paper Company, 6.11 cents; and Whitaker Paper Company, 6.11 cents.

For 5,460 pounds (52,000 sheets) of white M. F. printing paper: Reese & Reese, Inc., at 5.92 cents; Stanford Paper Company, 5.92 cents; and R. P. Andrews Paper Company, 5.92 cents.

New Distributor for Filler Clay

C. P. Robinson, 420 Lexington avenue, of New York, mill representative for wood pulp and paper mill supplies, has been appointed distributor of the refined filler clay produced by the Thomas Alabama Kaolin Company. The product will be available for the market in August. Undoubtedly within the next few months a superior coating clay will be available.

National Paper Votes Dividends

Directors of the National Paper and Type Company have voted dividends of $1.25 a share on the 5 per cent non-cumulative preferred stock and 25 cents a share on the new common stock.

CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, of Pulp and Paper Mills

General Construction News

Cheboygan, Mich.—The North American Pulp and Paper Corporation, manufacturer of book, tissue and other paper stocks, has approved plans for new one-story addition to mill, 138 x 208 feet, and will proceed with superstructure at once. It is reported to cost over $75,000, including equipment. General erection contract has been let to the Williams Construction Company, Niles, Mich.

Kansas City, Mo.—The General Box Company, Forrester-Nace Division, 1600 West Eighth street, manufacturer of corrugated boxes and containers, etc., will soon begin erection of new addition to plant, to be one-story, 100 x 190 feet, estimated to cost over $70,000, with equipment. Award for building superstructure has been let to Edwin Frost, 4421 Bellefontaine avenue, Kansas City. An award for heating, plumbing and electrical work will be made soon. Eugene Schneider, 2107 Grand avenue, city, is architect. D. Bruce Forrester is president.

Battle Creek, Mich.—The Michigan Carton Company, manufacturer of manila and kindred paper stocks, has concluded arrangements for purchase of tract of about 16 acres of land in local industrial district, formerly held by the Advance-Rumley Company, and will take title at once. It will be used for future expansion by purchasing company. A building now on site, previously used as a foundry, will be remodeled and improved for warehouse unit, primarily for raw material storage and distribution. Latter work will be carried out at early date.

Spring Hill, La.—The Southern Kraft Corporation, 220 East 42nd street, New York, N. Y., a subsidiary of International Paper & Power Company, same address, is awarding equipment contracts for proposed new kraft pulp and paper mill at Spring Hill, vicinity of Shreveport, La., where large tract of land has just been acquired. Award has been made to the Beloit Iron Works, Beloit, Wis., for two specially designed high-speed wide Fourdrinier papermaking machines and accessory equipment, to be ready for installation in 1938. Contract for equipment for power house, to use natural gas as fuel, will be placed soon, as well as awards for miscellaneous mill equipment. Entire project will represent an investment of about $7,000,000, with mill scheduled to be ready for operation early in 1939, with initial rating of 220,000 tons of kraft paper and paper board products per annum. A mill village will be constructed for operatives at the plant.

Binghamton, N. Y.—The Agfa-Ansco Corporation, Charles street, manufacturer of processed photographic papers, films and kindred products, has plans nearing completion for new addition to plant, comprising a three-story top extension to laboratory building, to be used for expansion in that division, as well as for general operating and office service. It will cost in excess of $200,000, with equipment. Work is scheduled to be placed under way soon. Lockwood, Greene Engineers, Inc., 30 Rockefeller Plaza, New York, N. Y., is architect and engineer.

Port Townsend, Wash.—The National Paper Products Company, manufacturer of kraft paper and paper board products, has awarded contract to the General Construction Company, 3840 Iowa street, Seattle, Wash., for dredging waterfront area in connection with new dock and warehouse building at mill, recently referred to in these columns, providing large increase in shipping and storage facilities. The dock will be 90 x 420 feet, with one-story warehouse structure, 60 x 400 feet, to be equipped with complete mechanical-handling apparatus. As previously noted, the Olympic Pile Driving Company, Port Townsend, has contract for the dock and warehouse. Entire project is reported to cost close to $100,000. E. W. Erickson is manager at the mill.

Cleveland, Ohio—The Ajax Paper Tube Company, 2135 West 26th street, manufacturer of paper tubing and other paper specialties, has arranged for lease of a two-story building at 2110 Superior Viaduct, totaling about 20,000 square feet of floor space and will occupy for expansion. The lease is for a ten-year period, with option to purchase. Structure will be remodeled and improved at once, and equipment installed for large increase in present capacity. A. F. Grimmer is president.

Fitchburg, Mass.—Crocker, Burbank & Co. Association, manufacturer of magazine, book and other paper stocks, has begun construction of new addition to mill, for which general contract was let recently to the W. J. Handley Company, 47 Nockledge street, Fitchburg. New unit will be two-story, 110 x 240 feet, and will be used primarily for storage and distributing service. It will cost over $70,000, with equipment, and will be located near the No. 9 mill at the plant.

Palmyra, Mich.—The Simplex Paper Corporation, Adrian, Mich., manufacturer of insulating, building and kindred paper products, has awarded general contract to Robb-Ott, Inc., Adrian, for new one-story addition to mill, for which superstructure will be placed under way at once. It will cost close to $25,000, with equipment, and will be used largely for expansion in storage and distributing department.

Ilchester, Md.—The Bartgis Brothers Company,

manufacturer of box board specialties, has begun erection of new one-story addition to mill, 80 x 110 feet, recently referred to in these columns, and will push work to early completion. New unit will be used for general expansion in operations and is reported to cost in excess of $50,000. Julius A. Kinlein, American Building, Baltimore, Md., is general contractor.

Ampthill, Va.—E. I. duPont de Nemours & Co., Wilmington, Del., has work nearing completion on new additions to cellophane mill at Ampthill, near Richmond, Va., on which construction has been in progress for a number of months, and will have new buildings equipped and ready for service in near future. The expansion will provide facilities for employment of more than 200 additional operatives, making a total working force over 800 persons in this division. Company also has work under way on new units for local cellulose rayon mill, where large increased capacity will be carried out. It is expected to complete the new buildings by the close of 1937, with equipment installation to provide for an addition of about 600 workers in this branch, developing a total working force of over 3,000 persons. Entire expansion will represent an investment in excess of $6,000,000, including buildings and machinery.

Sault au Cochon, Que.—The Anglo-Canadian Pulp and Paper Mills, Ltd., Quebec, Que., has concluded negotiations for purchase of about 1,000 square miles of timber properties at Sault au Cochan, Charlevoix County, heretofore held by Price Brothers & Co., Ltd., Quebec., for a reported consideration of $1,250,000. Purchasing company has plans under way for development of a portion of the tract at early date for pulpwood supply for newsprint mill, including the establishment of timber camp, with sawmills and other facilities.

Cornwall, Ont.—Courtaulds (Canada), Ltd., manufacturer of cellulose rayon products, has plans maturing for expansion and improvements in mill, including construction of a number of new one and multi-story units, and installation of equipment for large increase in present capacity. Work will be started soon and is scheduled for completion in 1938. A fund of about $3,000,000 has been authorized for program.

Fort William, Ont.—The Abitibi Power and Paper Company, Ltd., is developing increased production at its Fort William mill, which recently resumed operations. Present output is on a basis of about 3,000 tons of paper per month, giving a total production of about 40,000 tons monthly for all mills of company now in operation. The mill of the Ste. Anne Paper Company, Ltd., Beaupre, Que., a subsidiary interest, which has a rated capacity of about 60,000 tons per annum, is still idle.

New Companies

Chicago, Ill.—The Cellulose Process Corporation, 1 North La Salle street, has been organized with capital of 2,000 shares of stock, no par value, to manufacture and deal in cellulose and wood pulp products, etc. The incorporators include J. B. Graham and C. Larson. Company is represented by Thomas F. Howe, 1 North La Salle street, attorney.

Houston, Tex.—The Gulf Fiber Company has been incorporated under Delaware laws, with capital of $200,000, and headquarters at Houston, to manufacture fiber products of various kinds. The incorporators include George Swaine, Albert Buford and Charles H. Taylor, Houston. The Colonial Charter Company, Ford Building, Wilmington, Del., is corporate representative.

Paper Mills Win in Clay Cases

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 16, 1937—The United States Court of Appeals on Monday affirmed five judgments totaling approximately $96,000 representing excess charges by railroads over a period of years on clay shipped from North Carolina, South Carolina, and Georgia to paper mills in New York, New Jersey and Pennsylvania.

The dispute between the paper companies and the railroads began more than seven years ago. In 1930, the Interstate Commerce Commission found that the rates to the eastern section of the country were excessive and ordered the railroads, which included a large number of the major carriers in the section, to make reparations.

After a rehearing, the Commission affirmed its order in 1933. It was necessary, however, to sue in the District Court to enforce the order. The railroads appealed from judgments obtained by the West Virginia Pulp and Paper Company, the Caftanea Paper Company, the New York and Pennsylvania Company, the D. W. Bare Paper Company and the Empire Floor and Wall Tile Company.

The principal point raised on appeal was that the Interstate Commerce Commission established lower rates from the southern clay areas to central United States, than to the eastern seaboard, and that the reason was it took into consideration the element of water competition on the Atlantic Coast. The roads contended consideration of competition furnished by water transportation was improper. The Court of Appeals on Monday of last week said that there was nothing in the record to show the Commission considered water competition.

Bird Bonus Distribution

Bird & Son have sent out the following notice of their 1937 semi-annual service bonus distribution:

"We are glad to state that our operations so far this year justify the payment of the usual Semi-Annual Service Bonus. This payment will be made on June 30th, according to our usual plan.

"Employees who on June 30, 1937, have been in continuous service of Bird & Son, Inc., for over five years will receive 4 per cent of their normal six months' earnings. Employees whose service has been over two years, but less than five years, will receive 2 per cent. This Service Bonus is based on normal six months' earnings, figured as 26 weeks (of 40 hours) at the rate of pay of each individual as of June 1, 1937.

"We wish to state our appreciation to the organization for the splendid manner in which it has responded to the problems so far this year."

This notice affects all employees of Bird & Son, Inc., throughout the United States including plants and offices at East Walpole and Norwood, Mass.; Phillipsdale, R. I.; New York City; Chicago; and Shreveport, La.

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Herbert J. Laughton, *Associate Editor*
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COMING EVENTS IN THE PAPER INDUSTRY

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY—Fall Convention, DeSoto Hotel, Savannah, Ga., Oct. 18-20, 1937.

NEW ENGLAND SECTION, Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Nonotuck Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION, Technical Association of the Pulp and Paper Industry—Fourth Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION, Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION, Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park-American Hotel, Kalamazoo, Mich.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, Annual Meeting, Springfield, Mass., June 23-25.

ADVANCES IN CHEMISTRY

To meet the increasing world demand for the most improved chemical products and the most advanced chemical processing machinery, the American chemical industry is laying plans well ahead for the Chemical Exposition, which occurs in December. The Sixteenth Exposition of Chemical Industries will be held at Grand Central Palace, New York, December 6 to 11, 1937. Three entire floors of the Palace have been reserved for the event.

The calibre of exhibitors and the amount of floor space under contract indicate that the Sixteenth Exposition will be one of the most successful presentations of its kind ever held. At this time, five months in advance of the exposition, all space on the first and second floors of Grand Central Palace has been sold to exhibitors and one-fourth of the total available space on the third floor is under contract.

The Student Course in Chemical Engineering which has become an established feature, as conducted during the week of the exposition, will again be presented. This concentrated course in chemical processes and plant equipment, given in conjunction with the exposition, provides an unusual educational opportunity. Senior college students are eligible to enroll without cost from any part of the United States. One unique opportunity which the course provides is that of hearing national authorities in chemical engineering who are assembled at the exposition. Relating what they hear to actual practice, the students have the additional opportunity of studying the greatest collection of actual chemical engineering plant equipment and process machinery which is ever assembled in one place.

Prof. Harry J. Masson, head of the Department of Chemical Engineering at New York University, is chairman of the Educational Committee of the Exposition, under whose auspices the Student Course in Chemical Engineering is held. Prof. W. T. Read, Dean of Chemistry, Rutgers University, who has served as director of the Student Course at previous Chemical Expositions, will this year again be in full charge.

An unusual feature of the Sixteenth Exposition of Chemical Industries will be a slogan contest offering to the winner a prize of $250.00 in cash. The award will be made to the person who submits "the best descriptive expression encompassing the purposes and the benefits redounding to the common good from the activities of the Chemical Industries." As further indicated by the contest announcement, the chemical industries are themselves creative, they establish new industries and rehabilitate old. They create employment within themselves and in other industries, and are the manufacturers of diversified products which are of manifold use. These products serve to alleviate suffering, bring health and well-being, extend civilization, increase nature's productivity, and create national security and wealth. In their peaceful applications, which are of course predominant, the announcement points out, "the chemical industries contribute better than all else to the progress and happiness of mankind."

The fundamental character of the unit processes of chemical engineering and the diversified uses to which the products of chemical invention are applied serve to connect the chemical industry to all other fields of human activity. The recent Tercentenary of the American Chemical Industries brought to national attention the subject of their work and a realization of their importance. The Sixteenth Exposition of Chemical Industries will emphasize these points in terms of actual materials and machines.

Writing of "Man in a Chemical World," A. Cressy Morrison, author of the new book by that title says, "the many ramifications of this service (chemical industry) to humanity reach out in most amazing ways to affect all our activities." Good proof of this will be found at the chemical exposition this year. The availability of a complete review of the latest developments in a group of key industries is related to the practical value of being able to compare competitive technical achievements applicable to every phase of life and industry.

America holds the leading position in chemical in-

dustries and this year after the recent long period of depression there is a strong market representing entirely new plant construction. Then too, the rehabilitation of obsolete plant equipment is a strong factor in machinery sales. New processes being constantly developed require new factories and new machines. Increased production in old plants calls for modernization. Sometimes the ideal machine for a new process in one industry is already established in the industrial practice of another. Proper selection of existing machines and processes to cope with new manufacturing problems is often a by-product of the Exposition of Chemical Industries.

Attendance at the Chemical Exposition is drawn from all over the world. Admission is by invitation or by registration only. The audience this year will find the arrangement of exhibit material particularly suited to thorough inspection in minimum time. Advance indications, many from exhibitors who plan months ahead, are that the exhibits will be unusually graphic, comprehensive, and clear. Dynamic displays and process equipment actually in operation will constitute one of the most interesting features.

Newsprint Production Increases

Production of newsprint in Canada during May 1937 amounted to 309,232 tons and shipments to 311,883 tons, according to the News Print Service Bureau. Production in the United States was 79,003 tons and shipments 77,797 tons, making a total United States and Canadian newsprint production of 388,235 tons and shipments of 389,680 tons. During May 29,962 tons of newsprint were made in Newfoundland, so that the total North American production for the month amounted to 418,197 tons. Total production in May 1936 was 370,387 tons.

The Canadian mills produced 253,104 tons more in the first five months of 1937 than in the first five months of 1936, which was an increase of twenty and seven-tenths per cent. The output in the United States was 11,324 tons or three per cent more than in the first five months of 1936, and in Newfoundland 22,603 tons or seventeen and nine tenths per cent more, making a total increase of 287,031 tons, or sixteen and six-tenths per cent.

Stocks of newsprint paper at Canadian mills were reported at 69,357 tons at the end of May and 12,645 tons at United States mills, making a combined total of 82,002 tons compared with 83,447 tons on April 30, 1937.

Beveridge-Marvellum Co. Expands

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., June 22, 1937—The Beveridge-Marvellum Company of South Hadley Falls with a sister mill in Holyoke has leased space in the Hampshire Paper Company of the Falls to accommodate its increasing business. Papermaking in the Hampshire mills was discontinued some time ago although it continued to run its converting and stationery plant. The paper manufacture previously carried on at this plant has been taken over by the Carew Manufacturing Company.

Production Ratio Report

The statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES

Months	1937	1936	1935	1934
January	90.3% (c)	76.1%	65.8%	.....
February	90.1% (c)	77.9%	70.0%	.....
March	90.3% (c)	76.0%	70.5%	.....
April	92.1% (c)	82.3%	70.0%	.....
May	90.6% (c)	81.6%	69.4%	.....
June	.....	80.7%	72.3%	.....
July	.....	77.3%	64.9%	.....
August	.....	81.5%	70.9%	.....
September	.....	80.5%	71.9%	58.2%
October	.....	87.6%	75.6%	64.7%
November	.....	88.0%	75.3%	61.7%
December	.....	85.9%	71.2%	59.6%
Year Average	.....	81.3%	70.5%	.....
Year to Date First 23 weeks	90.3% (c)	78.9%	69.1%	.....

COMPARATIVE WEEKLY SUMMARIES

CURRENT WEEKS, 1937		CORRESPONDING WEEKS, 1936	
*May 8	89.5% (c)		
*May 15	90.4% (c)	May 9	81.4%
*May 22	91.2% (c)	May 16	81.9%
*May 29	90.8% (c)	May 23	83.1%
*June 5	85.2% (c)	May 30	79.8%
*June 12	86.9% (c)	June 6	81.7%
		June 13	81.1%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting, Current Weeks					
Ratio Limits	May 8, 1937	May 15, 1937	May 22, 1937	May 29, 1937	June 5, 1937	June 12, 1937
0% to 50%	37	49	41	45	55	38
51% to 100%	283	270	279	273	250	184
Total Mills Reporting	320	319	320	318	305	222

* Subject to revision until all reports are received.
(c) Basic capacity data have been adjusted to correspond with ratings reported on January 4, 1937 Machine Improvement Survey.

PAPERBOARD OPERATING RATIOS

According to reports from the National Paperboard Association, per cents of operation, based on "Inch-Hours", were as follows:

Mos.	1937	1936	1935	1934	Mos.	1937	1936	1935	1934
Jan.	80% (e)	61%	61%	....	July	....	69%	59%	....
Feb.	86% (e)	67%	67%	....	Aug.	....	75%	65%	....
Mar.	87% (e)	68%	67%	....	Sept.	....	76%	69%	52%
April	89% (e)	70%	61%	....	Oct.	....	82%	76%	63%
May	.....	68%	61%	....	Nov.	....	79%	70%	56%
June	....	68%	65%	....	Dec.	....	74%	60%	52%

Week end. May 8, 1937—87%
Week end. May 15, 1937—83%
Week end. May 22, 1937—86%
Week end. May 29, 1937—85%
Week end. June 5, 1937—76%
Week end. June 12, 1937—82%

(e) Basic figures revised to include new members of the National Paperboard Association.

Employees Accept Powers Offer

SPRINGFIELD, Mass., June 22, 1937—The Powers Paper Company offer of a 10 per cent raise in wages has been accepted by the employees, this being the same as accepted by the industrial union last week at the United States Envelope Company.

The plant will work on a 44 hour week of five days during the seven peak months and on a 40 hour week the rest of the time. The 44 hour week will consist of four nine hour days and one eight hour day. Minimum wages are 40 cents an hour, women, and 50 cents an hour minimum for men; and 55 cents an hour for men of over a year's experience.

Crocker-McElwain Co. Changes

HOLYOKE, Mass., June 21, 1937—C. H. Hill, chief plant engineer of the Crocker-McElwain Company has retired and his place has been taken by Ralph L. Bosworth of the maintenance staff. James Weir who was Mr. Hill's assistant has left to take an engineering position with the Rice Barton & Fales Company of Worcester.

"Okay"!

And no wonder—for coming through this printer's press is one of those "better" printing jobs done on Zinc Sulphide Pigmented paper. Better because the reproduction of his type and delicate halftones is enhanced by the brilliant whiteness of the paper. Better, too, because the Zinc Sulphide prevents any shadowy "show through" from marring the easy reading, clean cut appearance of his work.

Cryptone and **Albalith** Zinc Sulphide Pigments can be advantageously used in practically all types of white paper. And they offer an economical means of producing more opaque, whiter and brighter papers that will please *everyone*—the dealer, the printer and the consumer.

Our Technical Service Staff will welcome an opportunity to discuss the application of these pigments to your papers.

THE NEW JERSEY ZINC COMPANY
160 FRONT ST., NEW YORK

ZINC SULPHIDE PIGMENTS IN PAPER

Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Current Research on Pulp and Paper in the Government and University Laboratories of the United States and Canada

By Clarence J. West[1]

(Continued from the issue of June 17, 1937)

FOREST PRODUCTS LABORATORIES OF CANADA

Main Laboratories, Ottawa

(1). PROJECT: Variability in wood.

INVESTIGATORS: J. D. Hale and J. B. Prince.

OBJECT: To discover the extent of variation in the basic density of wood of the various pulpwood species, particularly the variation in average density of the same species growing in different localities as well as the range of variation within a species.

As the weight of the pulp obtainable from pulpwood is, within narrow limits, a definite proportion of the weight of the wood, measurement of the basic density or basic specific gravity of wood gives a reasonable indication of pulp yield. When more exact information is available regarding the basic density of wood from different types of stand, it should be possible for mills to plan the annual supply of pulpwood with better accuracy both with regard to yield and to the quality of pulp that the wood will produce.

ACCOMPLISHMENTS: Representative samples of pulpwood material for test have been obtained representing stands of softwood, black spruce or mixed types in the regions of Kenora, Kapuskasing and the east end of Lake Superior in Ontario, from the vicinity of the Gatineau (upper and lower), the Laurentides Park, Lake St. John and Gaspé in Quebec, from Northern and Southern New Brunswick, and from Western and Eastern Nova Scotia. determined for the material from some 50 of these sub- A total of some 70 sub-types is represented in material from these regions. The basic density of wood has been types. Significant data regarding the rate of growth, age, and form of the trees sampled have been recorded and tests on the rest of the shipment are in progress. The results obtained to date indicate that local variations in density are not directly due to differences in longitude. A stand of spruce from Eastern Canada, growing under similar conditions as the same species farther west, may be expected to produce wood of the same density. Local conditions, however, may affect the growing season or otherwise change the environment of similar types of stand, so as to cause the rate of growth of one stand to differ materially from that of the other, with the result that the different growth rates may be responsible for considerable difference in the density of the same species of wood produced by the respective stands. The density of wood in a stand of spruce timber may be approximately predicted in a preliminary survey from examination of the growth rate and general structure of an adequate sample of the stand.

WORK IN PROGRESS: It is proposed to complete tests of the material in hand; it will then be possible to determine whether there is any general trend of variation in density that is influenced by wide differences of latitude or other factors. From the data obtained by testing the sample, it will be possible to show the mean density and the extent of variation from the mean in any units desired. It should be possible to show how the mean density of wood from any stand varies and whether the variation is affected by diameter, age, rate of growth, geographic range, general and specific types of stands, or obscure site factors. Such information may be expressed in a form which will be useful in making more accurate estimates of the average density of wood in pulpwood stands than can be made at present. This may lead to better control over the pulp-producing quality of the season's wood supply sent to the mill.

(2). PROJECT: Decay of pulpwood in storage.

INVESTIGATORS: Clara W. Fritz and E. A. Atwell.

PURPOSE: The study of wood deterioration in storage piles, since the yearly loss to the industry through such deterioration is very considerable.

ACCOMPLISHMENTS: The investigation was started in 1931; and to date six lots of samples, collected at the direction of the Chairman of the Pulpwood Committee from ordinary block piles, have been received at the laboratories and studied. These samples were stored for periods from 0.5 to five years and then examined for advanced rot, incipient rot and stain; the values showed considerable variation. A study was also made of selected sample sticks placed in storage in 1932 in a block pile and of others placed in a corded pile. Sticks were grouped in bundles of six, each

[1] Member TAPPI. Chairman, Committee on Abstracts and Bibliography, Technical Association of the Pulp and Paper Industry.

bundle being surrounded by a covering layer of other sticks from the pulpwood on hand, so that it formed a protected core in a firmly chained unit, which could be moved intact to the storage conditions desired; these units were dropped into the pile. Samples of spruce and balsam, stored in the block pile for 4 years, showed an increase from 2 to 14 samples containing typical rot, and from 0 to 20 (all) containing incipient rot; stain increased from a trace to 8.84 per cent; of the 13 samples in the corded pile, none of which showed rot, 2 showed typical and 13 incipient rot after 4 years' storage; stain increased from 0 to 4.65 per cent.

Collections of fruit-bodies and of rotted wood upon which they were growing were made from pulpwood stored in two yards in the vicinity of Ottawa, and collections were received from the yards of five plants at different points. *Lenzites saepiaria* was found to be the most prevalent species in stored pulpwood, but it is by no means the only fungus active in the piles. *Stereum sanguinolentum*, a fungus active in standing trees, was well represented in the collections; several other fungi were obtained.

WORK IN PROGRESS: Analysis after further storage of test sticks left in block and storage piles.

Pulp and Paper Division, Montreal

The program outlined below includes the work of the staff of the Pulp and Paper Division of the Forest Products Laboratories and also that carried out through a special grant from the Pulp and Paper Association, administered by the Joint Administrative Committee. This grant provides for the employment of extra research workers in the Pulp and Paper Division, and the financing of cooperative studies with the Department of Physical Chemistry of McGill University, which studies are conducted by Dr. O. Maass and his graduate students in cooperation with the Forest Products Laboratories.

The Pulp and Paper Division is a Dominion Government research laboratory. The program of research of the Division is under Government supervision, but the general direction of the program is guided by the Joint Administrative Committee, composed of representatives from the Government, the Association, and the University. The organization works with considerable flexibility and has produced some results of interest.

Among the major accomplishments of the Division, mention may be made of the Canadian Standard Freeness Tester, the Maass photopacimeter, the Johnston Pulp Fiber Classifier, the Larocque oil absorbency tester, and other developments in testing of pulp and paper. In the field of research, considerable interest has been attracted by the work of W. B. Campbell on the physical properties of cellulose and pulps in relation to beating and sheet formation. Another investigation of interest, conducted by O. Maass and coworkers, was the study of the vapor pressure of sulphur dioxide in the presence of lime and water at different temperatures, a matter of some interest in the sulphite pulping process. Maass also investigated the penetration of wood by different cooking media and its effect upon pulping. J. H. Ross investigated the cooking of pulp at a number of concentrations and at sulphidities up to 100 per cent. H. W. Johnston has conducted investigations in grinding mechanical pulp at high peripheral speeds, resulting in increases in stone diameters used in a number of mills. Further studies are being made into the effect of process variables in grinding mechanical pulps. G. Larocque is engaged in studying the printability of paper and the effect of air conditions thereon.

Active investigation is in progress on the following projects:

(1). PROJECT: Routine testing of pulp and paper.

INVESTIGATORS: W. C. Lodge, C. Alexander, and W. S. Morris.

PURPOSE: To make such tests of samples of pulp and paper submitted for examination as the interest of the public service may require or the lack of adequate facilities in private and commercial testing laboratories may render advisable.

ACCOMPLISHMENTS: Under this head are included all miscellaneous routine tests carried out for members of the Canadian Pulp and Paper Association and others; also, the routine checking of instruments manufactured in Canada and accepted as standard instruments for the Canadian pulp and paper industry. The Canadian standard freeness tester now being manufactured in Canada is calibrated by the Division on request from the manufacturer before the instrument is shipped to the mill making the purchase. The British standard sheet machine now being manufactured in Canada is also calibrated by the Division. As new instruments become available, arrangements will be made for the calibration of such equipment upon request.

SUPPORT: Calibration fees and the cost of testing samples other than those tested for the Government or members of the Association are returned to the Receiver General.

(2). PROJECT: Methods of analysis and testing.

INVESTIGATORS: W. B. Campbell and W. C. Lodge.

PURPOSE: The development, testing and recording of standard methods of analysis.

ACCOMPLISHMENTS: From time to time, reports have been published under different headings, describing various methods of testing in use or which have been investi gated by the Division. During the past year, the Johnston pulp fiber classifier has been carefully tested to ascertain what tolerance in dimensions should be specified for manufacturing purposes and what was the actual distribution of fiber lengths in any given fraction retained between two consecutive screens. Arrangements have been made for the classifier to be manufactured and distributed by the Robert Mitchell Co., Limited of Montreal and to be calibrated by the Division prior to shipment. A comparison has been carried out between reflectance as determined by the Steele brightness tester and transmittency as measured by the Maass Photopacimeter. Using relations derived by O. Maass the transmittency can be calculated from the reflectance by the Steele instrument, and similarly reflectance can be calculated from transmittency as found with the Maass photopacimeter. Slight but constant differences have been found between the corresponding values of these two quantities determined as above, enabling results obtained from either instrument to be compared on a uniform basis. Drainage factors obtained under different static heads have been determined and are being studied to determine whether the results can be employed to interpret the behavior of stock on paper machines, particularly fast machines, such as those used for the production of newsprint paper.

WORK IN PROGRESS: It is proposed to continue the study of drainage on wire meshes at various heads to obtain further data on the behavior of stock during the formation of a sheet of paper.

(3). PROJECT: Absorption of alcohol on pulps.

PURPOSE: To discover the forces acting and the mechanics of their action when water is evaporated or otherwise removed from a sheet of wet pulp and thereby converted into a sheet of paper.

ACCOMPLISHMENTS: A number of reports have been published from time to time under headings outlining the progress of this investigation. The investigation has been discontinued and a final report prepared embodying the

findings reached, by J. K. Russell, to be published in the Canadian Journal of Research.

WORK IN PROGRESS: It is proposed to purchase two researches in the physical properties of cellulose conducted during past years at the Division for publication as a Government bulletin.

(4). PROJECT: Classification of pulp by selective screening.

INVESTIGATORS: W. B. Campbell and W. C. Lodge.

PURPOSE: To evolve a standard apparatus for the classification of pulp by selective screening; to standardize a procedure for the use of this apparatus in the routine testing and examination of mechanical and other pulps.

ACCOMPLISHMENTS: One type, developed at the Division, has been selected for standardization. Two units are used, one to effect the separation, and a second to collect the material passing the first screen. Material passing in 200 mesh is allowed to flow to waste and is measured by difference. The design of the instrument has been subjected to careful scrutiny to determine the suitability of the device for standardization. Improvements in operation, accuracy, and ease of manufacture have been incorporated into the design as a result of this investigation. Arrangements are being made for the manufacture, calibration, and distribution of the classifier through the same channels and in the same manner as in the case of the Canadian standard freeness tester.

WORKS IN PROGRESS: It is proposed to purchase two instruments from the manufacturer and to compare these with each other. One instrument would be preserved as a master standard for comparison with instruments to be calibrated, in order that users may rely upon reasonable reproducibility of results. It is planned to study further the properties of pulp fractions obtained by the use of this device.

(5). PROJECT: Sulphite pulping studies.

INVESTIGATORS: F. H. Yorston, C. R. Mitchell, and H. Green.

PURPOSE: To investigate the effect of known variables in the sulphite cooking process.

ACCOMPLISHMENTS: The rate of pulping of spruce at substantially constant concentration of sulphur dioxide and bisulphite has been studied under conditions such that the rate of penetration of liquor into the wood is not a factor. Relationships between the rate of cooking under these conditions and the liquor concentration have been worked out, and some comparisons have been made between spruce and other woods. The minimum degree of sulphonation of the lignin which will enable spruce to be completely pulped has been determined and the time required to obtain this degree of sulphonation has been determined in certain cases. The influence of hydrogen ion concentration on the rate of solution of sulphonated lignin has been investigated. The effect of variations in the concentration of combined sulphur dioxide on the physical properties of the pulps has been examined. The effect of pretreatment of the wood in various solutions on the rate of delignification has been investigated. Pulps have been made by the sulphite process from hardwoods, chiefly birch and aspen, using small autoclaves. The results have been encouraging so far as the production of pulps suitable for book and writing papers from species now left uncut in limits is concerned, provided that the cost of delivering to the mill the wood necessary for a ton of pulp is not excessive. The production of easy bleaching pulps in this manner and the investigation of factors tending to give bulky pulps after beating have received attention. The application of such pulps to newsprint without bleaching does not seem feasible.

WORK IN PROGRESS: Further investigations will be made toward producing pulps from both softwoods and hardwoods which will bleach readily and yield bulky pulps after beating.

(6). PROJECT: Groundwood studies.

INVESTIGATORS: H. W. Johnston and J. Edwards.

PURPOSE: To study certain variables of groundwood operations; to study the manner in which fibers are removed from wood by grinding and related processes for making mechanical wood pulp; to study the energy consumed in making mechanical pulps and its relation to other factors which govern the sheet-forming properties of such pulps.

ACCOMPLISHMENTS: It has been shown that commercial pulps of high strength and freeness can be produced at speeds up to 5600 feet per minute and grinding pressure up to 50 pounds per square inch of pocket area, using the 15 x 30 inch pulp grinder at the Division. No effect upon the horsepower per ton of pulp is observed for pulps for equal strength and freeness. During the past year a miniature pulp grinder with a 2 x 12 inch stone and a pocket area of 2 inches has been successfully operated at the Division. This instrument reduces greatly the quantity of wood required for an investigation and thus decreases the cost of this type of investigation. It is also easier to obtain consistently reproducible results with moderate quantities of wood. Preliminary results with different artificial stones showed that entirely fresh surfaces did not make good pulp until the pattern was modified by wear. Reversing the rotation of the stone caused reversion to poor pulp. Part of a dulling cycle was studied using a coarse stone and a complete dulling cycle with a fine stone. The influence of temperature, consistency, and depth of immersion of the stone in the pit was studied. Grinding pressures up to 175 pounds per square inch of wood-stone interface were studied for spruce, a few tests being made with jack pine, yellow birch, and seasoned wood. Speeds as high as 6000 feet per minute were studied, the pulp leaving the stone at higher speeds. The effect of progressively deepening the impression was examined. A heat balance was made which showed that within the limits of experimental error all energy furnished to the grinder reappears as heat. A number of progress reports on this project have been published during the past year.

WORK IN PROGRESS: Further investigation of operating variables and their effect upon the removal of fibers.

(7). PROJECT: Paper formation.

INVESTIGATORS: W. B. Campbell and W. C. Lodge.

PURPOSE: To study the effect of various factors involved in the conversion of a suspension of papermaking fibers in water into a coherent sheet of paper.

ACCOMPLISHMENTS: Calculations of the effect of table rolls in removing water have been made. Measurements of rates of drainage both on stationary wire molds and on paper machine wires have been secured for examination and comparison. Reports on this topic have been published.

WORK IN PROGRESS: Continuation of the above.

(8). PROJECT: Equilibria existing in sulphite liquors.

INVESTIGATORS: O. Maass, W. B. Campbell, and F. Walker.

PURPOSE: To study the influence of temperature, concentration, and the addition of reagents upon the equilibria existing in sulphite liquors.

ACCOMPLISHMENTS: A new apparatus has been built for studying the equilibria existing in calcium oxide-sul-

phur dioxide-water mixtures in the range of cooking temperatures.

WORK IN PROGRESS: Measurements are to be made on the influence of the presence of strong acids and wood on the equilibria existing in sulphite liquor.

(9). PROJECT: Printability of paper.

INVESTIGATORS: O. Maass, W. B. Campbell, H. W. Johnston, and G. Larocque.

PURPOSE: To study the printability of paper and the influence of types of pulp, methods of stuff preparation and additional ingredients in furnishes, conversion into paper, subsequent treatment and storage.

ACCOMPLISHMENTS: A critical study of the literature on printability of paper for the years 1933-1935 was completed. A Precision proof press is being used to study the relative printing characteristics of a wide range of papers.

The effect of adsorbed water vapor upon paper was examined in some detail. Values were obtained for the moisture contents of twenty papers, and their expansion behavior in both cross and machine directions with changes in atmospheric relative humidity. The value of the TAPPI wet-extension test and an indication of the humidity-expansion behavior of paper was investigated. Hysteresis effects in the humidity expansion of paper were examined. The previous moisture history of the paper markedly influences its subsequent humidity-extension behavior. Strains are present in paper as a result of the manufacturing process and these strains are released when the paper is subjected to an environment of high humidity. There results a permanent alteration in the paper dimensions. Subsequent moisture-extension behavior is then more regular than before. This contraction of the paper takes place even in the presence of a considerable opposing force. Measurements were made of the rate of expansion of newsprint and glassine papers *in vacuo* and in air. Experiments with newsprint have indicated that there is practically a linear relation between the moisture content and the per cent extension of paper. The extension is proportional to the per cent relative humidity and not to the absolute moisture content of the atmosphere. With regard to the printability of paper, work is progressing on the paper-oil-pigment relationship. Carbon black has been found to have a small but detectable affinity for paper material. A new capillary oil-drop technique has been devised for measuring the surface oil-adsorptivity of paper. The method seems to be more sensitive than previous devices for measuring this property, and shows promise as a tool for research.

WORK IN PROGRESS: Attention will be given to the question of whether printability depends chiefly upon the nature of the surface of fibers and their arrangement or whether the interior of the fiber influences the result. The problems of "show through" and "strike through" in newsprint are to be considered in relation to opacity, thickness, smoothness, etc.

(10). PROJECT: Thermal conductivity of pulp and paper.

INVESTIGATORS: W. B. Campbell, O. Maass, and R. A. Findlay.

PURPOSE: To develop an accurate method for measuring thermal conductivities of paper and board.

ACCOMPLISHMENTS: A new adiabatic arrangement has been developed which makes it possible to determine the heat conductivity of insulating material over a short temperature interval with a high degree of accuracy. This apparatus has been tested out and found to be suited for the measurements planned.

WORK IN PROGRESS: The study of the influence of temperature, humidity, filler, pressure, composition, etc., on the thermal conductivity of standard cellulose, paper, and board.

(11). PROJECT: Consistency measurements of pulp suspensions.

INVESTIGATOR: O. Maass.

PURPOSE: To determine the consistency of pulp suspensions by measuring the change in resistance brought about by the presence of the pulp in an electrolytic cell and to apply this principle to recording and controlling the consistencies of pulp.

ACCOMPLISHMENTS: It has been shown that the consistency of a pulp suspension can be rapidly determined by the change in conductivity brought about by the presence of pulp in one of two balanced electrolytic cells.

WORK IN PROGRESS: A standard instrument for consistency determinations is to be developed and its applicability for control and recording of pulp suspensions is to be investigated.

(12). PROJECT: Permanence of paper.

INVESTIGATORS: A. L. Geddes and W. B. Campbell.

PURPOSE: To investigate factors affecting the permanence and durability of paper with a view to the development of specifications for Government purchases of this commodity.

ACCOMPLISHMENTS: A number of samples of papers used for record purposes have been secured and tested for various physical properties, including tearing resistance and folding endurance, both before and after being subjected to an accelerated aging testing according to the method prescribed by the National Bureau of Standards.

WORK IN PROGRESS: The work will be further extended to include other types of paper, and the effect of such factors as sizing, acidity, etc., on the test will also be examined.

SUPPORT: National Research Council of Canada grant.

NATIONAL RESEARCH COUNCIL OF CANADA

Division of Chemistry, Ottawa

(1). PROJECT: Use of potato starch in paper finishing.

INVESTIGATOR: W. Gallay.

PURPOSE: To determine the suitability of modified potato starch in tub- and machine-sizing.

ACCOMPLISHMENT: The results to date have been promising.

SUPPORT: Government financial support. Laboratory and plant cooperation from the Forest Products Laboratories, Montreal, and from various pulp and paper mills.

(2). PROJECT: Potato dextrins as adhesives.

INVESTIGATORS: W. Gallay and A. C. Bell.

PURPOSE: To prepare from potato starch dextrins suitable for use in paper for various purposes.

ACCOMPLISHMENTS: The work is in a very early stage.

WORK IN PROGRESS: A study of the influence of the purity of the starch, the nature and amount of the acid, the temperature and the time of roasting on the quality of the dextrins produced. A study of methods of evaluating dextrins.

SUPPORT: Government funds. Plant and laboratory cooperation from industrial firms.

(3). PROJECT: Clays as paper fillers.

INVESTIGATOR: W. Gallay.

PURPOSE: To determine the suitability of domestic clays.

ACCOMPLISHMENTS: The work is in a very early stage.

WORK IN PROGRESS: Study of particle size, color, etc.

SUPPORT: Government funds. Cooperation of industrial firms in tests.

PROJECT: Permanency of paper

Transferred to the Forest Products Laboratories of Canada at Montreal under the supervision of their Director. Financed by the National Research Council of Canada, on behalf of the Canadian Government Purchasing Standards Committee. The present work, recently begun, is intended eventually to be a comprehensive investigation of factors affecting the permanence of paper for record purposes.

STATE AND CITY LABORATORIES

Industrial Committee of Savannah, Inc., Georgia Pulp and Paper Laboratory

(1). PROJECT: Determination of the best conditions for utilizing Southern pine for both chemical and mechanical pulps in the production of paper and rayon.

INVESTIGATORS: Charles H. Herty, Director; a staff of twenty concerned with the semi-commercial research production and the physical testing of the products.

ACCOMPLISHMENTS: Full data have been compiled on the sulphite pulping of Southern pine wood free of heart; preparation of groundwood for newsprint; production of newsprint, book, and bond paper, and viscose rayon pulps; together with estimates of cost.

WORK IN PROGRESS: Continued work on pulps, especially for chemical use, and a study of the fat and wax content of Southern pine.

SUPPORT: The Chemical Foundation, Inc., New York, N. Y., and the Industrial Committee of Savannah, Inc.

Wisconsin State Board of Health, Madison Bureau of Sanitary Engineering

(1) PROJECT: Investigation of the biochemical oxygen demand test as applied to pulp and paper mill wastes.

INVESTIGATORS: L. F. Warrick, J. M. Holderby, and W. L. Lea (Wisconsin State Laboratory of Hygiene).

PURPOSE: To determine such changes in the biochemical oxygen demand test as may be necessary to insure the rate of oxidation in the test being closely comparable to that actually maintained in receiving streams.

ACCOMPLISHMENTS: It has been found that certain industrial wastes such as those from pulp and paper mills are deficient in certain elements, such as nitrogen and phosphorus, normally present in fair amount in surface streams and which are necessary for healthy bacterial growth. For such wastes, the standard test gives low oxygen demand values and, accordingly, does not afford a true indication of the pollutional strength of the wastes. The addition of small amounts of nitrogen and phosphorus to the test portions results in higher values being obtained.

WORK IN PROGRESS: Direct comparisons are being made between the rates of biochemical oxidation of mill wastes using supplemental dilution water and water from various streams of the State.

SUPPORT: Departmental funds.

(2). PROJECT: Stability of samples of waste from pulp and paper mills.

INVESTIGATORS: L. F. Warrick, J. M. Holderby, and W. L. Lea.

PURPOSE: To determine whether or not it is necessary to sterilize mill waste samples being held for analysis.

ACCOMPLISHMENTS: Very little change has been noted to occur in suspended or dissolved solids and biochemical oxygen demand when unsterilized samples have been analyzed in a fresh condition and after a storage period of one week at room temperature.

WORK IN PROGRESS: Practically complete. Further check observations are to be made.

SUPPORT: Departmental funds.

(3). PROJECT: Reduction of pulp and paper mill wastes entering streams.

INVESTIGATORS: L. F. Warrick and J. M. Holderby.

PURPOSE: To determine the lower limits of necessary wastes from the manufacture of pulp and paper and to promote waste reduction through white water re-circulation and other means; and to minimize the pollution of streams by such wastes.

ACCOMPLISHMENTS: The work is a continuation of previously reported work on the same subject. Data have been obtained which further demonstrate the feasibility of reducing fiber losses from mills of all types to one per cent or less of finished product.

WORK IN PROGRESS: Compilation of 1936 data obtained for Wisconsin mills practically completed.

SUPPORT: Departmental funds and by mills involved.

UNIVERSITY AND PRIVATE LABORATORIES

(1). PROJECT: Effect of dry acid gases (hydrogen chloride, sulphur dioxide, etc.) dissolved in organic solvents upon sulphate pulp.

INVESTIGATORS: S. J. Lloyd and Raymond Bloodheim.

(2). PROJECT: Study of materials extracted by organic solvents from pine bark.

INVESTIGATORS: S. J. Lloyd and M. Aldermistian.

(3). PROJECT: Study of an oil derived from sulphate black liquor.

INVESTIGATORS: S. J. Lloyd and W. Garron.

These projects are being carried out as Master's theses. Boyce Thompson Institute for Plane Research, Inc.,

Yonkers, N. Y.

University of Alabama, Tuscaloosa, Ala.

(1). PROJECT: Analyses of cellulosic substances.

INVESTIGATORS: Florence L. Barrows, Jack Compton, Wanda K. Farr, Stanton Harris, Wayne A. Sisson, and Jeanne Thompson.

PURPOSE: A study of the structure and properties of native and "regenerated" cellulosic materials by means of microscopic, chemical, and x-ray diffraction technique.

ACCOMPLISHMENTS: Identification of uniform sized *cellulose particles* in the living cytoplasm of certain plant cells and the observation of cellulose membrane formation through a cementing together of these unit structures.

WORK IN PROGRESS: Detailed analysis of the separated membrane constituents and their behavior in the formation of cellulose derivatives.

SUPPORT: The Chemical Foundation, Inc., New York, N. Y.

University of Cincinnati, Cincinnati, Ohio Department of Lithographic Research

(1). PROJECT: Testing methods covering the use requirements of paper in offset lithography.

INVESTIGATOR: R. F. Reed.

PURPOSE: Development of methods and instruments suitable for use in the testing of printing papers for ability to register in multi-color printing, and for ink reception and drying of ink.

ACCOMPLISHMENTS: Two instruments have been developed: (1) the paper hygroscope, which indicates the hygrometric condition of paper in the pile, and (2) a register rule for checking paper distortion and stretch during printing.

WORK IN PROGRESS: Further studies of register problems and of problems of ink reception and drying. This laboratory also cooperates with the National Bureau of Standards in their work on printing quality of paper.

SUPPORT: This work is supported by the Lithographic Technical Foundation.

Columbia University in the City of New York
Department of Chemical Engineering

(1). PROJECT: Lignin solubilities.
INVESTIGATORS: R. H. McKee and M. G. Pelipetz.
PURPOSE: To remove and recover lignin from wood without chemical change of the lignin.
ACCOMPLISHMENTS: Results desired have been accomplished but a simplification of the process is being studied.
SUPPORT: University funds.

University of Idaho, Moscow, Idaho

(1). PROJECT: Studies on semi-chemical and mild pulping of sawmill wastes.
INVESTIGATORS: E. C. Jahn and graduate students.
PURPOSE: The production of pulp for structural materials and papers from the sawmill wastes and species of lesser economic value for lumber in the Idaho region. The development of mild, quick, and cheap processes for pulping these raw materials.
ACCOMPLISHMENTS: The behavior of wood when cooked with ammonium sulphite has been studied. Pulps have been obtained from sawmill wastes in high yields.
SUPPORT: University funds.

(2). PROJECT: Retention of insoluble inorganic materials by cellulose fibers and wood particles.
INVESTIGATORS: E. C. Jahn and graduate students.
PURPOSE: The retention of substances which, in the case of fiber boards, serve to make the material fire-retardant and, in the case of paper pulps, increase opacity and whiteness.
SUPPORT: University Funds.

(3). PROJECT: The production of dense and light types of fiber boards and the modification of their properties.
INVESTIGATORS: E. C. Jahn and graduate students.
PURPOSE: The development of fiber products, particularly strong structural materials, from sawmill wastes and the fire- and moisture-proofing of such products.
ACCOMPLISHMENTS: The degree of fire-resistance given to fiber boards by a variety of chemicals has been reported in the literature. Apparatus for certain physical tests have been devised. A method for producing strong boards is being studied.
SUPPORT: University funds.

(4). PROJECT: The plasticization and adhesion of wood particles.
INVESTIGATORS: E. C. Jahn and graduate students.
Under this project the following work is of interest to pulp and paper research: Influence of mechanical action, in the presence of water, on the surface activity and degree of gelatinization of cellulose and wood. Effect of the partial degradation of wood particles by heat (at various pressures) and by chemicals on its surface condition and mechanical adhesion. Resinous reaction products of lignin.
ACCOMPLISHMENTS: Conditions for obtaining optimum strength of adhesion between wood particles when subjected to heat and pressure have been determined. The molding of gelatinized cellulose and wood is being studied. Lignin plastics, from isolated lignin, and with lignin *in situ*, have been prepared.
SUPPORT: In part by two fellowships donated by Potlatch Forests, Inc., Lewiston, Idaho.

(5). PROJECT: Measurement of the degree of gelatinization of cellulose and wood.
INVESTIGATORS: E. C. Jahn and graduate students.
PURPOSE: To study conditions whereby it may be possible to obtain a satisfactory method for a direct measure of hydrated or imbibed water in pulp and wood.
ACCOMPLISHMENTS: A preliminary study of a method for obtaining a numerical value of the relative degree of gelatinization has been reported in the literature.
SUPPORT: In part by a TAPPI research grant.

The Institute of Paper Chemistry, Appleton, Wis.

The program of fundamental research being carried on at The Institute of Paper Chemistry is so closely interwoven with the various applied studies, as to make any specific list of such projects decidedly misleading.

During the last two years there have been carried on in the laboratories of the Institute 98 sponsored projects and 42 Institute projects. These have been under the supervision of eight group leaders working with a staff of forty technicians. An estimate of the time devoted to the work such as would come under the heading of fundamental research shows that at least one-third of the time of the above group has been devoted to problems of this nature. Attention should be called to the fact that none of this work has been of a routine nature.

These projects have been carried on in the fields of instrumentation, colloids, lignin and cellulose, fiber analysis and fiber structure, microscopy and photomicroscopy, bacteriology, and wood technology. In addition to these there have been a large number of graduate investigations carried on by the students in the fields of fundamental science. Results of student work in 1935-1936 were embodied in three doctorate and eight Master of Science dissertations submitted to the Institute. During the present academic year there are six students conducting research for a Ph.D. degree and eleven for the M.S. degree.

During 1936 ten papers have appeared in the technical literature, in addition to the reports of the instrumentation program, nineteen of which are in press.

Iowa State College, Ames, Iowa

(1). PROJECT: Paper from agricultural wastes.
INVESTIGATORS: O. R. Sweeney, E. R. Whittemore, R. Tillson, W. E. Patterson, Baker Wingfield, C. B. Overman, T. R. McElhinney, and W. E. Patterson.
PURPOSE: Development of suitable processes and equipment for making kraft, glassine, and writing papers from cereal straws and suitable cooking liquor recovery.
ACCOMPLISHMENTS: During the period 1930-1934, this was a cooperative research with the National Bureau of Standards, during which time studies were made on paper from wheat, oat, and rye straw, and on cornstalks, using modified kraft and soda processes and sulphuric acid digestion. Since July, 1934, the work has been under the direction of the Department of Agriculture.
See statement under Bureau of Chemistry and Soils, Industrial-Farm Products Division.
SUPPORT: State and Government funds.

McGill University, Montreal, Canada
Division of Industrial and Cellulose Chemistry

A small grant to cover work on the following projects has been made by the Canadian Pulp and Paper Association.

(1). PROJECT: Structure of lignin.
INVESTIGATORS: G. F. Wright, G. H. Tomlinson, and Messrs. Bell, Cramer, Dorland, Hawkins, Hunter, Leger, Lieff, and Lynn (Ph.D. theses).
PURPOSE: To determine the structure of lignin.
ACCOMPLISHMENTS: Lignin contains aromatic rings, in particular the vanillyl radical, but appears to be largely non-aromatic in character. Semi-industrial manufacture of vanillin from waste sulphite liquor has been completed. For other details, consult publications from this laboratory.

WORK PLANNED: Continuation of research on structure of lignin and its relation to the sulphite and kraft pulping processes; commercial production of vanillin; plastics.

SUPPORT: University Professorship funds, Canadian National Research Council funds, industrial scholarships.

(2). PROJECT: Bleaching of pulp.

INVESTIGATORS: Messrs. Swartz, McCarthy, and Schwartz (Ph.D. theses).

PURPOSE: Determination of the mechanism of bleaching and semi-industrial application to kraft and sulphite pulps.

ACCOMPLISHMENTS: The mechanism of the action of chlorine on isolated alkali lignin has been investigated at varying pH values.

WORK IN PROGRESS: Application of the results to the bleaching of pulp on the laboratory and semi-industrial scale.

SUPPORT: Canadian National Research Council, industrial fellowships, and private funds.

(3). PROJECT: Chemical pulps.

INVESTIGATOR: R. G. D. Moore and Messrs. Penniston and Dorland (Ph.D. theses).

PURPOSE: An investigation of the factors which influence the quality of chemical pulps.

SUPPORT: Industrial scholarships.

(4). PROJECT: Polymerization and new cellulose derivatives.

INVESTIGATOR: R. Fordyce.

PURPOSE: Study of factors relating to plant synthesis, the chemical forces involved in micelle and fiber formation and relation of viscosity to chain length.

ACCOMPLISHMENTS: Long chain polyethylene ether glycols with a molecular weight up to 7,000 have been synthesized and their viscosities determined.

WORK IN PROGRESS: The applicability of Staudinger's laws to be reviewed. Synthesis of higher members of the polyethylene ether glycols.

SUPPORT: Private funds.

(5). PROJECT: Investigation of bacterial polysaccharides.

INVESTIGATOR: Not yet appointed.

PURPOSE: Investigation of synthetic cellulose and other bacterial polysaccharides, mechanism of plant synthesis and role of bacterial polysaccharides in immunology.

ACCOMPLISHMENTS: A true synthetic cellulose has been made from a variety of sugars as well as from glycerol and other organic compounds. The building unit has been shown by W. K. Farr to be identical with that of the cellulose unit in the immature cotton fiber. The structure of dextran has been ascertained in broad outline.

WORK IN PROGRESS: Conclusive proof of structure of dextran and relation to immunological problems.

SUPPORT: Canadian National Research Council.

Department of Botany

(1). PROJECT: Studies in tree physiology: (1) Seasonal changes in water-content of standing trees; (2) carbohydrate economy of the tree; (3) frost resistance.

INVESTIGATORS: R. D. Gibbs, G. W. Scarth, C. Frankton, and D. Diminovitch.

PURPOSE: To determine optimal time of cutting; to obtain information of academic interest which, however, may be of practical interest as well, in revealing seasonal changes in the chemical ingredients of wood.

ACCOMPLISHMENTS: (1) The water contents of *Populus tremuloides* and *Betula populifolia* are at a maximum at the end of April; at a minimum in September. Poplar fills with water in the fall; birch only partially. Both trees lose considerable water in the period November-April. (2) Both sugar and starch fall to a low level during spring growth and increase again during the summer. In autumn sugar increases still further at the expense of starch; this is reversed immediately prior to spring growth when both sugar and water content reach a maximum.

WORK IN PROGRESS: (1) Completion of work on poplar and field birch, extension to maple, yellow birch, larch, hemlock, etc. (2) Chemical investigation is being made to discover the nature of the colloidal material in the cell, especially of trees, which is found to increase in winter.

SUPPORT: National Research Council of Canada and McGill University.

University of Maine, Orono, Maine
Department of Pulp and Paper Technology

(1). PROJECT: Paper sizing.

INVESTIGATORS: P. D. Bray, John Bessom, and Shirley Parsons.

PURPOSE: To study some of the present methods of determining the degree of sizing in papers with a view to making improvements.

ACCOMPLISHMENTS: Work in progress.

(2). PROJECT: Study of the refining of groundwood pulp screenings as determined by use of the Appleton selective screen.

INVESTIGATORS: P. D. Bray, Robert A. Thompson, and Jiun Shyr.

PURPOSE: To determine, by use of the Appleton selective screen, the amount of refining done on groundwood pulp screenings, and if the screen has a qualitative control value.

ACCOMPLISHMENTS: Work finished.

SUPPORT: From TAPPI and the Department.

Massachusetts Institute of Technology, Cambridge, Mass.
School of Chemical Engineering Practice, Bangor Station

(1). PROJECT: Measurement of chemical stack losses from recovery furnaces.

INVESTIGATORS: H. S. Gardner, R. P. Whitney, and students.

PURPOSE: Accurate measurement of chemical stack losses from recovery furnaces may have an important bearing on the efficiency of the chemical recovery cycle, since such losses are of major significance.

ACCOMPLISHMENTS: Satisfactory techniques have been developed for the measurement of stack losses, and measurements of losses in industrial installations have been made. A modern furnace, with higher gas velocities and with the feed sprayed into the furnace, gave definitely higher losses than the conventional rotary type.

(2). PROJECT: Electrolysis of sodium chloride brine.

INVESTIGATORS: H. S. Gardner and students.

PURPOSE: A study of the operating characteristics of several types of industrial electrolytic cells is being made, in order to determine optimum operating conditions. The rate of electrode decomposition, and the factors influencing it, will also be investigated.

(3). PROJECT: Absorption of chlorine for bleaching solutions.

INVESTIGATORS: H. S. Gardner and students.

PURPOSE: From a study of the performance of industrial absorption equipment, it is hoped to obtain data which may be used to test the applicability of existing theory, and to provide an improved basis for design.

Mellon Institute of Industrial Research
University of Pittsburgh, Pittsburgh, Pa.

(1). PROJECT: Specialty papers.
INVESTIGATOR: P. B. Davidson.

PURPOSE: The development of specialty papers and the improvement of the fine and special grades of paper and paper products manufactured by the donor of the fellowship.

ACCOMPLISHMENTS: Of several special papers produced, the most successful is a decorative paper for greeting, announcement and menu cards that has some metallic particles dispersed throughout the body of the sheet. By varying the color of these particles and the color of the paper itself, combinations are obtained that have proved to be attractive for these and such other uses as pamphlet binders and cover stocks of various kinds. Adhesives have been produced that will not discolor those parts of an envelope that are sealed together during the process of manufacture. Accelerated aging tests on these adhesives have been verified by natural aging tests conducted in different sections of the country. These properties assume greater significance in the manufacture of novelties from bond and writing papers than from the less expensive wood-pulp papers. The application of sucrose octaacetate to paper imparts to certain papers a mellow translucency that has suggested its use in greeting card stocks or other kindred specialty papers, where strength, pleasing texture, excellent printing properties, and translucency are important considerations.

WORK IN PROGRESS: Specialty papers, particularly improving the fine and special grades of paper and paper products of interest to the donor.

SUPPORT: Fellowship founded and sustained by the Strathmore Paper Company, West Springfield, Mass.

University of Michigan, Ann Arbor, Mich.

(1). PROJECT: Drying of pulp and paper.
INVESTIGATORS: D. W. McCready and students.
PURPOSE: A determination of the mechanism of drying pulp and paper, of the influence of variables on the rate of drying and properties of the paper, and of the engineering data required for the proper design and operation of drying equipment.

ACCOMPLISHMENTS: The mechanism of drying has been determined and the influence of the principal variables on the drying rate evaluated.
SUPPORT: University funds.

(2). PROJECT: Alkaline pulp cooking process.
INVESTIGATORS: D. W. McCready and students.
PURPOSE: A determination of the rate of reaction of alkaline cooking liquors with wood.
ACCOMPLISHMENTS: The rate of reaction of sodium hydroxide cooking liquors has been evaluated.
SUPPORT: University funds.

University of Minnesota, University Farm, St. Paul, Minn.

(1). PROJECT: Chemistry of wood and wood products.
INVESTIGATORS: R. A. Gortner and graduate students.
PURPOSE: To ascertain the effect of the various ingredients upon the individual constituents of wood.

ACCOMPLISHMENTS: Studies have been made of the cooking of wood with water alone and aqueous solutions of sodium carbonate, sodium sulphate, sodium thiosulphate, sodium sulphite, sodium sulphide, sodium hydroxide and trisodium phosphate, and of the effect of the same chemical on various varieties of woods. The alpha-cellulose from different wood sources has also been investigated, as well as the pulping of woods with organic reagents, and the effect of these reagents on the wood constituents. Ten publications have been issued.

WORK IN PROGRESS: Various phases of the general subject are being studied by graduate students.

SUPPORT: The University is wholly supporting the work at the present time. From 1927 to 1935, a very considerable measure of support was provided by the Northwest Paper Company, Cloquet, Minn., which maintained an industrial fellowship at the University for these particular studies.

(2). PROJECT: Movement of liquid in woods.
INVESTIGATORS: R. A. Gortner, H. Schmitz, and H. Erickson.
PURPOSE: Fundamental study of the project.
ACCOMPLISHMENTS: One publication has been issued.
SUPPORT: The American Creosoting Company, Louisville, Ky., contributes approximately $1200 a year; the remainder is provided by the University.

New York State College of Forestry at Syracuse University, Syracuse, N. Y.

(1). PROJECT: Study of the variables in the Brown mechanical pulping process.
INVESTIGATORS: C. E. Libby and Myron Kin.
PURPOSE: It is proposed to determine the optimum conditions for cooking and grinding yellow birch wood to minimize the discoloration and produce a pulp of maximum strength.
ACCOMPLISHMENTS: Analysis of original wood being used, several cooks completed, and analysis of cooked wood and liquor extracts under way.
SUPPORT: A College fellowship for one year.

(2). PROJECT: The effect of particle size on the results of the rosin sizing operation.
INVESTIGATORS: C. E. Libby and Firth L. Dennett.
PURPOSE: This study, which is being carried out with chemically pure materials, is to determine the extent to which the size of the rosin particle, as measured with the ultramicroscope, influences the efficiency of a rosin size emulsion.
ACCOMPLISHMENTS: Preparation of pure abietic acid and ash-free pulp. Evaluation tests on the pulp being employed. Investigation of methods for determining the extent of rosin distribution on fiber.
SUPPORT: A College fellowship for one year.

(3). PROJECT: Comparative study of the standard Schopper fold tester and the Thwing-Clark multiple folding instrument.
INVESTIGATORS: C. E. Libby and Simon Posen.
PURPOSE: A limited investigation to check the operating characteristics of these two instruments on papers of varying weights with respect to time required for identical tests, deviation of individual tests from mean, agreement of results between individual units of the multiple fold tester, etc.
ACCOMPLISHMENTS: Data developed from approximately 500 hours of continuous operation of these two instruments indicated the necessity of rebuilding certain parts of the multiple fold tester and this work is now under way.
SUPPORT: College research funds.

(4). PROJECT: Fiber measurements.
INVESTIGATORS: W. O. Hisey and Richard L. Betts.
PURPOSE: To evaluate some of the fundamental properties of fibers, particularly surface area, which are basic to studies of pulping and paper manufacture.
ACCOMPLISHMENTS: One method of measuring surface

area has been investigated and work on a second method is now under way.

SUPPORT: A College fellowship for one year.

(5). PROJECT: The effect of hydrogen ion concentration on the chemical purity of bleached pulps.

INVESTIGATORS: W. O. Hisey and William R. Davis.

PURPOSE: To check previous results using soda base instead of calcium base liquor, and to determine the effect of pH on the chemical properties of the bleached pulps by use of buffers during bleaching.

ACCOMPLISHMENTS: The work on this problem has been completed and a paper is being prepared for publication.

SUPPORT: A College fellowship for one year.

(6) PROJECT: Reactions of wood with organic chemicals.

INVESTIGATORS: F. C. Peterson and William R. Davis.

PURPOSE: The objectives of the problem are the fundamental chemical and constitutional studies of the residues resulting from the digestions of wood with various organic chemicals and the technology and utilization of such residues.

ACCOMPLISHMENTS: Literature survey and analysis of the woods being investigated.

SUPPORT: An annual grant from the Dow Chemical Company for a period of three years.

(7). PROJECT: Metal derivatives of lignin.

INVESTIGATORS: F. C. Peterson, E. L. Kropscott, and A. J. Barry.

PURPOSE: Preparation and study of metal derivatives of lignin made by the reaction of the latter with alkali metals in liquid ammonia. To be followed by preparation and study of esters and ethers derived from these metal salts.

ACCOMPLISHMENTS: Sodium derivatives prepared and analyzed; preliminary runs completed on esterification of the metal salts.

SUPPORT: College fellowship.

(8). PROJECT: X-ray studies of the action of amines and other non-aqueous systems on cellulose.

INVESTIGATORS: A. J. Barry, A. J. King, and F. C. Peterson.

PURPOSE: Study of action of certain non-aqueous liquids on cellulose as revealed by x-ray diffraction patterns; to correlate these effects with one another, and with such previously recognized effects of hydration, compound formation, etc.

ACCOMPLISHMENTS: Discovery of two types of apparent compound formation between cellulose and ammonia, of a new crystalline form of cellulose when ammonia is completely driven from these compounds, of permutoid type of swelling or possible compound formation when cellulose is treated with each of a series of several aliphatic amines.

SUPPORT: No financial support except for cost of materials.

University of North Carolina, Chapel Hill, N. C.

(1). PROJECT: Study of the permeabilities of cellulosic membranes to gases and vapors.

INVESTIGATOR: Sherman E. Smith.

PURPOSE: To determine the extent and mechanism of permeation of all sorts of cellulosic films by gases and vapors and to apply this information to the problem of the fine structure of these films.

ACCOMPLISHMENTS: The results indicate that gas penetration of cellulosic films always takes place by a modified solution process, and that considerable information as to the interstitial spacing and binding forces in cellulose and cellulose derivatives may be obtained by this method.

WORK IN PROGRESS: The work is being continued along the above lines:

SUPPORT: During the year 1935-1936, this project was in the form of a post-doctorate investigation under the direction of Edward Mack, Jr., and W. H. Charch, of the duPont Cellophane Company, Inc., of Buffalo, N. Y. The University of North Carolina furnished supplies, equipment, and laboratory facilities; the duPont Cellophane Company has supplied materials, samples, and salary.

(2). PROJECT: Recovery of oil and alpha-cellulose from whole cotton.

INVESTIGATORS: Frank K. Cameron, Director. D. T. Milne is studying the extraction of oil by various solvents at Chapel Hill, and Mr. Dockery is studying at Rockingham, the control of plant growth by cultural methods and harvesting methods. Recent workers have been J. P. Sanders, A. T. Clifford, A. R. Macormac, and E. G. Egan.

PURPOSE: To determine if the cotton plant (an annual) can be developed as a commercial source of alpha-cellulose. To find a crop for the farmers of the Carolinas, particularly, to replace the growing of cotton for lint, which can probably be done elsewhere more economically.

ACCOMPLISHMENTS: It has been shown that by close planting, substituting harrowing for hoeing and cutting down on fertilizer applications, the plant can be brought to a maximum production of cellulose in about 26 weeks. The whole plant is harvested and baled with the same type of equipment used for hay; it can be stored in the open for years without deterioration. The dry plant is easily pulverized and the oil extracted. The residue is in the best possible physical condition for pulping. On the laboratory scale, alpha-cellulose has been prepared from the whole cotton and from lint, stems and cusps independently, by the sulphate, sulphite, alkali, and nitric acid methods. These celluloses and derivatives are the same as those from spruce, poplar, and pine, Consumption of reagents in processing appears to be somewhat less for cotton than for the woods. Harvesting by mechanical methods has been demonstrated successfully by the John Deere Company.

WORK IN PROGRESS: Study of the oils extracted by various solvents; study of comparative methods of pulping to find if there is a preferable one for "whole cotton" and to provide sufficient amounts of pulp for practical tests in making rayon, plastics, etc.; continuation of cultivation tests on different varieties of cotton; continuation of mechanical methods of harvesting.

SUPPORT: The Cotton Producers Cooperative Association contributed about $700 five years ago for preliminary work. This fall (1936) the John Deere Company paid the expenses of a harvesting demonstration by their equipment. All other expenses have been carried by the investigators themselves.

Ohio State University, Columbus, Ohio

(1). PROJECT: Electrometric examination of digester liquor in the sulphate process.

INVESTIGATORS: A. R. Miller, Jr., and James A. Withrow.

PURPOSE: To investigate the applicability of the tungsten-nickel pair and the antimony electrode in the determination of the total alkalinity of sulphate digester liquor.

ACCOMPLISHMENTS: Experimental data have been collected to indicate that the tungsten-nickel pair, but not

the antimony electrode, lends itself to the determination of total alkalinity of commercial sulphate digester liquor.

(2). PROJECT: Rate of flow of rag stuff.
INVESTIGATORS: C. E. Roth and James R. Withrow.
PURPOSE: To obtain chemical engineering constants pertaining to the rate of flow of rag stuff under varying conditions, such as consistency, time of beating, etc.
ACCOMPLISHMENTS: Experimental data have been collected which indicate, among other things, that the freeness decreases with beating, increases with temperature, and is not much affected by the amount of rosin size used.

(3). PROJECT: Deinking of printed paper.
INVESTIGATORS: Wm. Abele and James R. Withrow.
PURPOSE: Determination of the effectiveness of various detergents in the deinking of paper.
ACCOMPLISHMENTS: Present data indicate, among other things, that "Ivory" soap, trisodium phosphate, sodium metasilicate, and soda ash are effective as detergents in deinking paper in the order given.

(4). PROJECT: Capiliary phenomena of commercial cellulose.
INVESTIGATORS: Yi Ou-Yang and James R. Withrow.
PURPOSE: To determine the factors which affect the measurement of the capillarity of paper, the effect of various sizing materials on capillarity and the relationship between the capillarity of paper and the nature of the liquid.
ACCOMPLISHMENTS: Experimental work indicates, among other things, that the magnitude of capillarity of paper is reduced by the effect of the evaporation of the liquid, increases with temperature and is removed by the sizing process.

(5). PROJECT: Bleaching of paper pulps.
INVESTIGATORS: S. J. Weiskirchner and James R. Withrow.
PURPOSE: Evaluation of unbleached paper pulp to determine optimum conditions to obtain pulp of a white color.
ACCOMPLISHMENTS: Increase in alkalinity decreases the bleach consumption of the pulp and the resulting whiteness.

(6). PROJECT: Chemistry of the sulphate process.
INVESTIGATORS: Yi Ou-Yang and James R. Withrow.
PURPOSE: To ascertain whether the weakness of soda and the strength of sulphate pulp are due to the oxycellulose content of these pulps.
ACCOMPLISHMENTS: Several analytical procedures indicate that soda pulp contains more oxycellulose than the sulphate pulp.

(7). PROJECT: Chlorinated lime bleach.
INVESTIGATORS: F. L. Thomas and James R. Withrow.
PURPOSE: To investigate the chlorination of dolomitic lime for the purpose of making a bleach that could be utilized in the paper industry.
ACCOMPLISHMENTS: Laboratory results indicate that chlorination of dolomitic limes and the separation and utilization of the sludges might be feasible under proper conditions.

(8). PROJECT: Gums in pulp.
INVESTIGATORS: L. Simerl and James R. Withrow.
PURPOSE: Investigation of a shorter method for determination of harmful gums in pulp.
ACCOMPLISHMENTS: Experimental data show that the standard TAPPI procedure for the determination of pitch in pulp is satisfactory; petroleum ether, dichloromethane, acetone, ethyl alcohol, and tetrahydronaphthalene extract from 0.8 to 3.08 per cent of pitch from pulp, increasing in amount in the order of solvents as listed.

(9). PROJECT: Straw pulps.
INVESTIGATORS: T. I. Liao and James R. Withrow.
PURPOSE: Determination of the effect of various conditions in pulping wheat straw by the electrolytic hypochlorite method.
ACCOMPLISHMENTS: Both wheat straw and spruce sawdust were successfully pulped by the direct electrolysis of sodium chloride solution with yields of 46 and 60 per cent respectively.

(10). PROJECT: Lime in causticizing green paper mill liquor.
INVESTIGATORS: R. C. Ruffer and James R. Withrow.
PURPOSE: To determine the effects of various limes on the causticizing of green paper mill liquor; in search of the quality of lime best suited for the purpose.
ACCOMPLISHMENTS: The data indicate that the calcium oxide content of the lime alone is no measure of its ability to causticize green liquors.

(11). PROJECT: Gums in pulps.
INVESTIGATORS: R. F. Snider and James R. Withrow.
PURPOSE: To determine the minimum time of complete extraction of pitch from pulps, using common solvents with boiling points between 78.5 and 207 deg. C.
ACCOMPLISHMENTS: A toluene extraction of pitch from pulp can be accomplished in four hours; this pitch is not identical with that extracted by ether; ether extracts twice as much material from pulp as does toluene.

(12). PROJECT: Deinking of paper.
INVESTIGATORS: J. L. Dum and James R. Withrow.
PURPOSE: Determination of the deinking qualities of various detergents under variable conditions.
ACCOMPLISHMENTS: Of all the detergents studied, the highest percentage deinking was accomplished with a mixture of four grams of soda ash and three grams of bentonite per liter, at 25 deg. C.; this produced 81 per cent deinking.

Oregon State Agricultural College, Corvallis, Ore.

(1). PROJECT: Study of lignin and lignosulphonic acids.
INVESTIGATOR: Leo Friedman.
PURPOSE: To gain further information concerning the nature of lignin and study of its possible utilization.
WORK IN PROGRESS: A study of the lignin in Western hemlock and of the lignosulphonic acids formed during the sulphite pulping of this wood.
SUPPORT: Some of the materials are supplied by pulp manufacturers, the remainder by the Department of Chemistry, Oregon State College.

University of Washington, Seattle, Wash.
Department of Chemistry and Chemical Engineering

(1). PROJECT: Wood chemical industries.
INVESTIGATORS: Thos. F. Doumani, Charles Butler, Mary Barker, and Lulu Tollnoor.
PURPOSE: A survey of the recent literature dealing with the chemical utilization of wood.
ACCOMPLISHMENTS: A manuscript for a bulletin to be issued by the Secretary of State has been completed.
SUPPORT: Project 7005, sponsored by the Washington State Planning Council.

(2). PROJECT: Pulping of Douglas fir by ammonium bisulphite.

INVESTIGATORS: H. K. Benson, J. W. Wenger, and assistants.

PURPOSE: The use of Douglas fir as a cellulosic raw material.

ACCOMPLISHMENTS: The age rings of a Douglas fir tree, 300 years old, have been pulped.

SUPPORT: University and N. Y. A. funds.

(3). PROJECT: Organic compounds as lignin solvents.

INVESTIGATORS: H. K. Benson and H. W. Vanderhoof

PURPOSE: The effectiveness of organic compounds, such as acetoacetic ester, in the removal of lignin from finely divided wood.

ACCOMPLISHMENTS: Experiments are under way in a thesis study.

SUPPORT: University funds.

(4). PROJECT: Study of sulphite waste liquor reactions at the lime end point.

INVESTIGATORS: H. K. Benson and R. D. Mennell.

PURPOSE: To utilize the properties of this liquor as a road binder.

ACCOMPLISHMENTS: Experiments are under way in a thesis study.

SUPPORT: University funds.

(5). PROJECT: Colloidal properties of sulphite waste liquor.

INVESTIGATORS: K. A. Kobe and C. Dernbach.

PURPOSE: Extension of fundamental knowledge of the colloidal properties of sulphite waste liquor.

ACCOMPLISHMENTS: Study of precipitation, of electrophoresis, and electrodialysis of the colloid.

SUPPORT: University funds.

(6). PROJECT: Specific heat of sulphite waste liquor.

INVESTIGATORS: K. A. Kobe and W. McCleave.

PURPOSE: Determination of specific heat of sulphite waste liquor containing various amounts of solids.

SUPPORT: University funds.

(7). PROJECT: The rate of sulphur dioxide gas absorption by solutions of constant combined contents.

INVESTIGATORS: W. L. Beuschlein, Milton A. Porter, and F. C. Whitmore.

PURPOSE: The determination of absorption rates in limestone-packed towers.

ACCOMPLISHMENTS: Absorption coefficients for conditions of temperature, pressure, and concentrations similar to those found in practice have been determined.

SUPPORT: University funds.

(8). PROJECT: Rate of solution of limestone in sulphurous acid solutions.

INVESTIGATORS: W. L. Beuschlein and Lowell Schultz.

PURPOSE: The determination of absorption rates in limestone-packed towers.

ACCOMPLISHMENTS: Solution rates for conditions of temperature and concentration similar to those found in practice have been determined.

SUPPORT: University funds.

(9). PROJECT: Further studies of the system: CaO—SO_2—H_2O (acid region).

INVESTIGATORS: W. L. Beuschlein and Harry S. Fisher.

PURPOSE: The determination of the solubility of lime in sulphurous acid solutions at elevated temperatures and pressures.

SUPPORT: University funds.

(10). PROJECT: The vapor pressure of $CaSO_3$—$2H_2O$ and $CaSO_3$—$0.5H_2O$.

INVESTIGATORS: W. L. Beuschlein, John Pauly, and L. C. Johnson.

PURPOSE: Extension of the knowledge of the properties of the solid phase present in calcium bisulphite solutions.

ACCOMPLISHMENTS: Vapor pressure data for the dihydrate from 0 deg. C. to the decomposition temperature have been determined.

SUPPORT: University funds.

(11). PROJECT: Study of rate of change of the ratio of combined to free sulphur dioxide in solution as a function of sulphur dioxide pressure above the solution and of temperature.

INVESTIGATORS: W. L. Beuschlein and G. H. Hemmen.

PURPOSE: A study of factors affecting the absorption of sulphur dioxide gas in limestone-packed towers.

ACCOMPLISHMENTS: The ratio is independent of gas concentration and dependent upon temperature.

SUPPORT: University funds.

(12.) PROJECTS: Heat transfer coefficients for sulphite liquors, sulphite cooking liquor, and waste sulphite liquor.

INVESTIGATORS: W. L. Beuschlein and Arne Eriksen.

PURPOSE: Determination of engineering data for the design of heat exchangers.

ACCOMPLISHMENTS: Preliminary work has been completed.

SUPPORT: University funds.

(13). PROJECT: Viscosity determinations of sulphite liquor, sulphite cooking liquor, and waste sulphite liquor.

INVESTIGATORS: W. L. Beuschlein and Peter S. Lindsey.

PURPOSE: Physical data determinations for engineering design purposes.

ACCOMPLISHMENTS: Viscosities below 100 deg. C. have been measured.

SUPPORT: University funds.

(14). PROJECT: Study of lignin from Douglas fir wood.

INVESTIGATORS: W. L. Beuschlein, Paul Silverstone, and James Cordiner.

PURPOSE: Fundamental knowledge of the lignin molecule.

ACCOMPLISHMENTS: Preliminary work has been completed.

SUPPORT: University funds.

(15). PROJECT: Location of lignin in the cell walls of wood.

INVESTIGATOR: B. L. Grondal, College of Forestry.

PURPOSE: Fundamental research on location of lignin.

SUPPORT: Walker Ames Foundation, University of Washington.

Functional Color

The Crimson Press of New York has just published a book by Faber Birren entitled Functional Color. It has 128 pages 6 x 9 inches, cloth bound and contains six full page plates. Color harmony is handled from the functional viewpoint and a new and radical principle developed which capitalizes simple laws of vision. It deals with such problems as legibility, visibility, color for identification, to promote safety and contains extensive lists of the color standardization work already done by various businesses. Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry at $2.00 per copy.

Pulp and Paper Industry Literature Review

Abstracts of Articles and Patents Compiled by the Abstracts and Bibliography Committee of the Technical Association of the Pulp and Paper Industry, A. Papineau-Couture, John F. Ohlson, C. E. Peterson and Clarence J. West, Chairman

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C., for 10 cents each. Send currency, not stamps.

Cellulose

Problems Concerning Highly Polymerized Natural Products. Angew. Chem. 49, No. 47:841-843 (Nov. 21, 1936). Haworth's method of determination of the chain length of cellulose by estimating the 2, 3, 4, 6-tetramethylglucose formed from the terminal groups is considered incorrect for three reasons: 1) during the acetylation and subsequent saponification, a partial hydrolysis of the cellulose may occur; 2) no quantitative separation of the penta- from the tetramethylglucose is possible according to Haworth's method; 3) the refractive index cannot be used for a quantitative determination of mixtures of methylated sugars. Experiments with carefully purified cotton show that native cotton does not yield any pentamethylglucose, thus indicating that in native cotton no terminal group can be detected.—C.J.W.

Reaction of "Oxycellulose" (Oxidized cellulose) with Nessler Reagent. J. Prakt. Chem. 147, no. 6-9:167-187 (Nov. 10, 1936). The reaction of oxycellulose with Nessler reagent, first observed by Ditz in 1907, and which, in recent years, has been used as a test for bleaching damage and for the control of the bleaching process and also in the textile industry, has been studied for a number of oxycelluloses prepared with hypochlorite and related to their reduction capacity as characterized by their copper numbers. The observed color reactions, after 1 minute, 30 minutes, and 48 hours, in the order of increasing copper number, were: 0.09, very pale yellow, yellow, yellow; 0.44, light orange, orange, greenish yellow; 3.22, orange to brown, gray brown to gray red, gray; 4.15, orange to brown, dark gray, dark gray. The primary reaction is assumed to be the reduction of the mercuric iodide in the alkaline reagent ($KHgI_2$) to mercurous iodide, probably by the aldehyde group of the oxycellulose: $2KHgI_2 + —CHO \rightarrow Hg_2I_2 + —CO_2H + 2KI + 2HI$, the HI and $—CO_2H$ being neutralized by the excess of alkali present. The continued color change from a yellow to a more or less deep orange or brown is due to the decomposition of the mercurous iodide to mercuric iodide and free mercury. Since the mercurous iodide is yellow, the mercuric iodide is red and the free mercury is gray or black gray, various shades of orange and brown may result. The reduction of the mercuric iodide to the mercurous salt and its decomposition to the mercuric salt and mercury is accelerated by the strongly reducing oxycellulose. Finally, the reaction of the mercuric iodide with the potassium iodide formed in the reaction to give or reform the Nessler reagent may produce a black gray color due to the metallic mercury.—C.J.W.

Oxidation of Cellulose in the Presence of Protective Colloids. N. Jermolenko and W. Bondarin. Cellulosechemie 17, no. 10:108-110 (Oct. 4, 1936). On oxidation of cellulose by means of bromine or iodine, equilibrium is established after one hour. In the presence of protective colloids, such as gelatin or dextrin, these colloids are absorbed on the surface of the cellulose and the oxidizing action decreases. The decreased dye absorption of cellulose in the presence of protective colloids may also be explained by the formation of protective absorption films on the surface of the cellulose—C.J.W.

The Hydrophilic Properties of Cellulose. II. The Hydrophilic Properties of Electropositive Cellulose fibers. Kisou Kanamaru and Takayoshi .Nakamura Kolloid-Z. 77 no. 3:357-365 (Dec., 1936). Wood pulp fibers were treated with solutions of polyvalent cations (such as aluminum) under such conditions of temperature, concentration, and vapor pressure as would render the fiber effectively electropositive. The hydrophilic characteristics of these fibers were then studied. It was observed that electropositive fibers possess a lesser degree of hygroscopicity and a greater dielectric resistance as compared to the normal electronegative cellulose. These characteristics are greatly influenced by variations in treatment, or reversal of the effects seeming to occur when vapor pressures in excess of 30% are employed during the treatment. Under higher temperature treatment and under prolonged treatment, the tensile and dielectric strengths are reduced and the hygroscopicity is increased.—C.J.W.

The Hydrophilic Properties of Cellulose. III. The Hydrophilic Properties of Electro-Neutral Cellulose. K. Kanamaru and T. Nakamura. Kolloid-Z. 78, no. 1:83-87 (Jan., 1937). Wood pulp fibers and manila fibers were studied after treatment with aluminum chloride solutions adjusted to convert the fibers into an electrostatically neutral condition. The hygroscopicity and dielectric properties of the fibers were found to vary as the electrostatic conditions changed. As the electronegative charge was depressed, the hygroscopicity decreased and the dielectric properties increased, reaching a minimum and maximum, respectively, at the point of minimum electrostatic charge. As the process was continued into the region of positive charge, the hydrophilic properties increased while the dielectric diminished. The results are given a theoretical discussion.—C.J.W.

Molecular Structure of Cellulose. II. Evidence of the Chemically Modified Cotton Celluloses. G. F. Davidson. J. Text. Inst. 27:P. 159-168 (1936).—When cotton cellulose is attacked by acids there is a continuous decrease in tensile strength and in the viscosity in cuprammonium solution, and a continuous increase in copper number and in solubility in cold aqueous sodium hydroxide. The relations between these four properties are independent of the nature of the acid and the conditions of hydrolysis. This is explicable by the molecular chain theory if rupture of the glucoside linkings occurs always at points randomly distributed along the chain molecules. For a given average chain length the distribution of chain lengths will then always be the same. When cotton cellulose is attacked by oxidizing agents the relations between the properties of the oxycellulose depend on the nature of the oxidizing agent, and this would be expected if the mechanism of oxidation varied. Different types of oxycellulose are differently affected by hot dilute alkalies, and this also can be explained by the molecular chain theory.—A.P.-C.

Cellulose Derivatives. Ralph E. Montonna. Paper Trade J. 103, No. 23:35-39 (Dec. 3, 1936).—An outline of developments carried out in the last few years as regards cellulose esters, ethers, and nitrogen-containing derivatives, with bibliography of 104 references.—A.P.-C.

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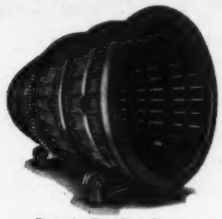

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Newsprint ..... 15,119 rolls
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Wrapping paper ..... 1,054 rolls, 11 cs.
Packing paper ..... 3 bls.
Filter paper ..... 41 pkgs., 98 bls., 31 cs.
Filter compound ..... 75 bls.
Surface coated paper ..... 98 cs.
Photo paper ..... 5 cs.
Decalcomania paper ..... 7 cs., 9 drums (duplex)
Decalcomanias ..... 65 cs.
Transfer pictures ..... 15 cs.
Copying paper ..... 5 rolls, 1 cs.
Gummed paper ..... 7 cs.
Paper tubes ..... 168 cs.
Straw boards ..... 204 rolls
Miscellaneous paper ..... 992 rolls, 185 bls., 146 cs.

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Champagne Paper Corp., *Ile de France,* Havre, 580 cs.

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——, *Aquitania,* Southampton, 1 cs.
——, *Berengaria,* Southampton, 1 pkge.

NEWSPRINT

H. G. Craig Co., *Donpaco,* Donnacona, 364 rolls.
International Paper Co., *International No. 1,* Gatineau, 308 rolls.
N. Y. Evening Journal, *Markland,* Liverpool, N. S., 730 rolls.
N. Y. Tribune, *Markland,* Liverpool, N. S., 1862 rolls.
World Telegram, *Markland,* Liverpool, N. S., 905 rolls.
Westchester Newspapers, Inc., *Markland,* Liverpool, N. S., 45 rolls.
Brooklyn Daily Eagle, *Markland,* Liverpool, N. S., 353 rolls.
Washington Post, *Markland,* Liverpool, N. S., 132 rolls.
Parsons & Whittemore, Inc., *Markland,* Liverpool, N. S., 142 rolls.
N. Y. Evening Journal, *Hardingham,* Quebec, 3996 rolls.
Daily Mirror, Inc., *Hardingham,* Quebec, 2177 rolls.
H. G. Craig Co., *A. C. D.,* Donnacona, 305 rolls.
H. G. Craig Co., *Kermic,* Donnacona, 305 rolls
Perkins Goodwin & Co, *Deutschland,* Hamburg, 429 rolls.
Jay Madden Corp., *Pr. Harding,* Hamburg, 357 rolls.
Newspaper & Magazine Paper Corp., *Svanehom,* Norrkoping, 1487 rolls.
Brooklyn Daily Times, *Svaneholm,* Hallstavik, 557 rolls.
Gilman Paper Co., *Svaneholm,* Hallstavik, 665 rolls.

PRINTING PAPER

Oxford University Press, *Carinthia,* London, 1 cs.
E. Dietzgen & Co., *Deutschland,* Hamburg, 5 cs.
Parsons & Whittemore, Inc., *Pr. Harding,* Hamburg, 730 rolls.

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Steiner Paper Corp., *Spaarndam,* Rotterdam, 3 bls.

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J. Manheimer, *Aquitania,* Southampton, 98 bls.
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Sellers Transportation Co., *Deutschland,* Hamburg, 49 cs.
Sellers Transportation Co., *Europa,* Bremen, 16 cs.

TRANSFER PICTURES

Rohner Gehrig & Co., *Europa,* Bremen, 15 cs.

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——, *Spaarndam,* Rotterdam, 204 rolls.

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Coty Processing Co., *Normandie,* Havre, 8 cs.
Keuffel & Esser Co., *Deutschland,* Hamburg, 98 cs., 43 rolls.
Dingelstedt & Co., *Deutschland,* Hamburg, 28 cs.
——, *Deutschland,* Hamburg, 949 rolls, 184 bls.

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Linter Supply Co., *Noshiro Maru,* Kobe, 200 bls. cotton waste.
D. S. Stern, *Noshiro Maru,* Kobe, 250 bls. cotton waste.
Darmstadt Scott & Courtney, *Noshiro Maru,* Kobe, 6 bls. thread waste.
W. Steck & Co., *Indep. Hall,* Havre, 40 bls. rags.
D. Benedetto, Inc., *Indep. Hall,* Havre, 88 bls. bagging.
——, *Indep. Hall,* Havre, 109 bls. cotton waste.
J. Cohen & Son Co., Inc., *Indep. Hall,* Havre, 32 bls. new cuttings.
R. Blank, *Indep. Hall,* Havre, 132 bls. rags, 38 bls. old garments.
Castle & Overton, Inc., *Indep. Hall,* Havre, 35 bls. rags.
——, *Indep. Hall,* Dunkirk, 45 bls. rags.
——, *Transylvania,* Glasgow, 54 bls. paper stock.

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C. Comiter Co., *Uyo Maru,* Kobe, 250 bls. cotton waste.
———, *Silveray,* Bombay, 200 bls. cotton waste.
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Royal Manfg. Co., *American Shipper,* Manchester, 18 bls. cotton waste.
Leigh Textile Co., *American Shipper,* Manchester, 42 bls. cotton waste.
———, *American Trader,* London, 58 bls. old strings.
Banco Coml Italiane Trust Co., *Ary Lensen,* Izmir, 157 bls. dark cottons.
Banco Coml Italiane Trust Co., *Ary Lensen,* Istanbul, 64 bls. rags.
E. J. Keller Co., Inc., *Ary Lensen,* ———, 21 bls. bagging, 374 bls. paper stock.
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R. Blank, *Ary Lensen,* Alexandria, 152 bls. rags.
———, *Scythia,* Liverpool, 7 bls. rags.
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———, *Gerolstein,* Antwerp, 59 bls. old strings.
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Darmstadt Scott & Courtney, *Pr. Harding,* Hamburg, 6 bls. rags, 13 bls. threads.

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Bank of The Manhattan Trust Co., *Birmania,* Trieste, 1831 bls. wood pulp.
———, *Birmania,* Trieste,, 326 bls. good pulp.
Absorbo Beer Pad Co., *Saturnia,* Trieste, 728 bls. wood pulp
———, *Deutschland,* Hamburg, 412 bls. wood pulp, 56 tons.
Castle & Overton, Inc., *Deutschland,* Hamburg, 1120 bls. wood pulp, 224 tons.
Bulkley Dunton Pulp Co., Inc., *Svaneholm,* ———, 4500 bls. wood pulp.
D. M. Hicks, Inc., *Svaneholm,* Gothenburg, 240 bls. chemical pulp.
Gottesman & Co., Inc., *Svaneholm,* Gothenburg, 600 bls. sulphate.
Gottesman & Co., Inc., *Schwanheim,* Hernosand, 5430 bls. kraft pulp, 905 tons.
Price & Pierce, Ltd., *Schwanheim,* Hernosand, 450 bls. sulphate, 75 tons; 1200 bls. sulphite, 200 tons.
Bank of The Manhattan Trust Co., *Schwanheim,* Hernosand, 600 bls. sulphate, 100 tons; 1380 bls. sulphite, 230 tons.
———, *Schwahnheim,* Iggesund, 3500 bls. sulphite, 700 tons; 2000 bls. sulphate, 400 tons.
Pagel Horton & Co., Inc., *Schwanheim,* Husum, 3245 bls. sulphate, 525 tons.
Pagel Horton & Co., Inc., *Schwanheim,* Hornefors, 2700 bls. sulphite, 457 tons.

WOOD PULP BOARDS

———, *Deutschland,* Hamburg, 250 bls.

NEWARK IMPORTS

WEEK ENDING JUNE 19, 1937

H. G. Craig Co., *Donnacona No. 1,* Montreal, 599 rolls newsprint.
H. G. Craig Co., *Newscarrier,* Donnacona, 347 rolls newsprint.

PORTLAND IMPORTS

WEEK ENDING JUNE 19, 1937

Pagel Horton & Co., Inc., *Schwanheim,* Sweden, 9522 bls. wood pulp.
Gottesman & Co., Inc., *Schwanheim,* Sweden, 2200 bls. wood pulp.

BOSTON IMPORTS

WEEK ENDING JUNE 19, 1937

Reach & Craven, *Indep. Hall,* Havre, 1 cs. painting paper.
Ayres W. C. Jones Co., *Indep. Hall,* Havre, 30 bls. cotton waste.
Royal Manfg. Co., *Indep. Hall,* Havre, 39 bls. cotton waste.
———, *Indep. Hall,* Havre, 100 bls. bagging.
Irving Trust Co., *Indep. Hall,* Havre, 47 bls. bagging.
Irving Trust Co., *Indep. Hall,* Dunkirk, 112 bls. bagging.
———, *Indep. Hall,* Dunkirk, 46 bls. rags.
Irving Trust Co., *Spaarndam,* Rotterdam, 137 bls. glue stock.
Gottesman & Co., Inc., *Schwanheim,* Sweden, 1000 bls. wood pulp.
E. J. Keller Co., Inc., *Black Osprey,* ———, 56 bls. bagging.

NEW LONDON IMPORTS

WEEK ENDING JUNE 19, 1937

Pagel Horton & Co., Inc., *Belos,* Sweden, 6180 bls. wood pulp.

PHILADELPHIA IMPORTS

WEEK ENDING JUNE 19, 1937

———, *Extavia,* Piraeus, 58 bls. rags.
———, *G. Maersk,* Kobe, 480 bls. rags.
Chase National Bank, *G. Maersk,* Yokohama, 200 bls. rags.
Bank of The Manhattan Trust Co., *Birmania,* Trieste, 1293 bls. wood pulp.
Philadelphia Inquirer Co., *Svaneholm,* Hallstavik, 503 rolls newsprint.
Gottesman & Co., Inc., *Svaneholm,* Gothenburg, 1200 bls. sulphate.
E. J. Keller Co., Inc., *Spaarndam,* ———, 52 bls. rags.

BALTIMORE IMPORTS

WEEK ENDING JUNE 19, 1937

Castle & Overton, Inc., *Black Falcon,* Rotterdam, 875 bls. wood pulp, 175 tons.
Congoleum Nairn Co., *Black Falcon,* Antwerp, 447 bls. rags.

NORFOLK IMPORTS

WEEK ENDING JUNE 19, 1937

———, *G. Maersk,* Kobe, 630 bls. bagging.
Gottesman & Co., Inc., *Georgia,* Sweden, 2750 bls. wood pulp.

NEW ORLEANS IMPORTS

WEEK ENDING JUNE 19, 1937

Continental Bank Trust Co., *Ida,* Naples, 136 bls. rags.

MONTREAL IMPORTS

WEEK ENDING JUNE 19, 1937

Gottesman & Co., Inc., *Idefjord,* Sweden, 8900 bls. wood pulp.
Gottesman & Co., Inc., *Norefjord,* Sweden, 21,893 bls. wood pulp.
Pagel Horton & Co., Inc., *Idefjord,* Sweden, 9750 bls. wood pulp.
Pagel Horton & Co., Inc., *Gezina,* Sweden, 12,780 bls. wood pulp.

CHEMICAL & MECHANICAL PULP

J. Andersen & Co.
Selling Agents
21 East 40th Street
New York

Kraft Pulp
BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
KALIX TRÄINDUSTRI AKTIEBOLAG
Vanaffärden, Sweden
MUNKSUNDS AKTIEBOLAG
Munksund, Sweden
NENSJÖ CELLULOSA A.-B.
Sprängsviken, Sweden

Bleached Sulphite
KELLNER-PARTINGTON PAPER PULP CO., LTD.
Sarpsborg, Norway
Edsvalla, Sweden
Hallein & Villach, Austria

Unbleached Sulphite
AKTIESELSKABET GREAKER CELLULOSEFABRIK
Greaker, Norway
BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
CELLULOSEFABRIKS A.-G.
Bratislava, Czecho-Slovakia
SVANÖ AKTIEBOLAG
Svanö, Sweden

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Write us about your Felt problems and let us help you reduce your Felt Costs—we will call anywhere at any time.

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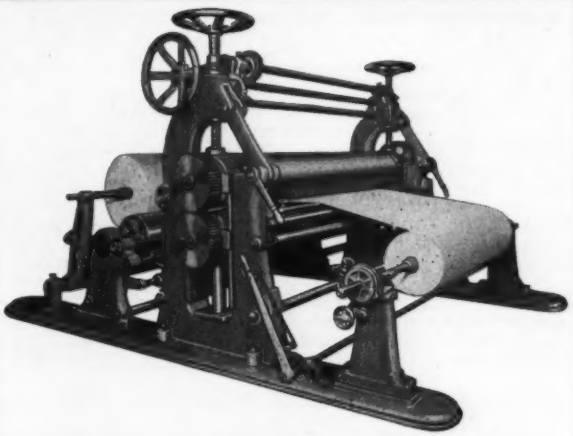

STANDARD EMBOSSER

For tissues, cardboards, covers, offset papers, liner boards and other materials taken off jumbo rolls and delivered to rewinder.

Unit illustrated has single drum winder but same unit may be furnished with double drum or friction shaft winder.

Hudson Sharp embossers may be obtained in varied designs for any purpose. Hudson Sharp steel embossing rolls and paper rolls are especially designed for any embossing purpose.

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Green Bay, Wisconsin

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Special Types to Meet Unusual Requirements

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at 800′ per minute

USERS of the new S & W straight line tuber report seam variations held to less than 1/16 inch.

For a competitive advantage in the paper bag market, investigate S & W machinery: tubers, bottomers and complete bag machinery.

The SMITH & WINCHESTER MFG. Co.
SOUTH WINDHAM, CONNECTICUT

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, June 23, 1937.

The paper market is less active than it has been in recent weeks. The recession in demand is, however, causing no great concern as a seasonal slackening in request for paper is usually expected at this time of the year.

In spite of the quieter demand, paper quotations show no appreciable changes.

Mechanical Pulp

The production of ground wood has been greatly accelerated because of the heavy and frequent rains that have prevailed in the pulp making centers and this has, naturally, been conducive to an increased output of ground wood. This has resulted in the usual competition with waste papers which have shown considerable weakness recently. In consequence of this condition of affairs, the demand for ground wood at current quotations has not been quite as brisk recently as it has been for the last few weeks.

Chemical Pulp

While the market for chemical pulp has quieted down considerably, this is not taken to mean that it may not strengthen again later in the year. Recent purchases for the next year have been reported as having been concluded at attractive prices for good grades of imported pulp which apparently indicates that the possibilities of a slump in the near future is not likely. There have been a few instances, it is said, of resales at prices lower than those quoted by the mills abroad on kraft and unbleached sulphite, but bleached sulphite for rayon is still in great demand and only the production of this type of pulp has been increased. Considerably higher prices for this commodity can undoubtedly be expected.

Old Rope and Bagging

The position of the old rope market is little changed. Paper mill demand for foreign and domestic old manila rope is satisfactory. Small mixed rope is moving slowly. The bagging market is only moderately active. Demand for both domestic and imported gunny and scrap bagging is about normal for the season.

Rags

The domestic rag market is practically unchanged. The demand for old rags is quiet and with the exception of old whites, is rather irregular. Roofing grades are rather inactive.

Waste Paper

The demand for better grades of waste paper is quite satisfactory but the request for lower grades is rather weak.

Timberlands in Southeast in Demand

Forest Managers, Inc., consulting Foresters, Jacksonville, Fla., report that timberlands are beginning to attract attention again for the first time since the collapse of the Florida land boom in 1926. For eleven years forest lands have been going begging. After the boom period many large tracts went back to the original owners through mortgage foreclosures. Prices of forest products sank to low levels and the only activity in the land market was in distressed property. The market price of good producing forest lands went far below actual values.

Now forest products of all kinds are approaching record heights and the new demand for pulpwood which promises to reach large proportions in a few years is calling attention to the possibilities of profit presented by these lands. Prices are still low but the demand is increasing and the trend is definitely upward.

Taxes on forest lands have been going down for the past ten years and in most counties in north Florida and south Georgia are at the lowest level for the past twenty years. The trees have continued to grow regardless of the depression and the majority of properties especially those protected from fire have a much better growing stock than was the case ten years ago. In the meantime transportation facilities have been improved and large tracts have been made more accesible by the continued construction of graded roads by the C. C. C. workers as well as by the states and counties. All of these developments have combined to make carefully selected timberlands one of the most attractive investments there are.

New Bulletin On Fluid Meters

A new 40-page Catalog "Bailey Fluid Meters for Steam—Liquids—Gases", designated as Bulletin 301, is being distributed by Bailey Meter Company, 1050 Ivanhoe road, Cleveland, Ohio, to those interested in flow meter.

This bulletin illustrates the manner in which any desired combination of indicating, recording and integrating features may be combined with a flow mechanism suitable for the measurement of steam, liquids or gases under high, low or medium pressures.

It explains how the powerful, self-contained Ledoux Bell flow mechanism operates to record the rate of flow without requiring an external power source; explains how auxiliary recorders for pressure and temperature may be incorporated to record on the same chart with the record of flow; describes the Bailey Escapement Integrator; describes a wide variety of primary elements and accessories and discusses major installation considerations.

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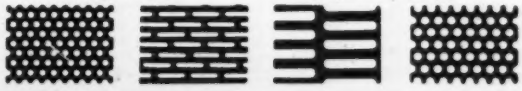
Any Metal Any Perforation



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Dilts
MACHINE WORKS Inc. FULTON, N.Y.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, June 23, 1937.

BLANC FIXE—The blanc fixe market continues regular. Prices are generally holding to formerly quoted levels. The pulp is offered at from $42.50 to $45 per ton, in bulk; while the powder is selling at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER—Trading in the bleaching powder market is moderately active. The contract movement is normal and prices are generally maintained at formerly quoted levels. Bleaching powder is offered at from $2 to $2.25 per 100 pounds, in drums, at works.

CASEIN—The casein market is somewhat steadier. Domestic standard ground casein is now quoted at from 13 @ 14 cents per pound; while domestic finely ground casein is selling at from 13½ @ 14½ cents per pound, all in bags, car lot quantities.

CAUSTIC SODA—Conditions in the caustic soda market are fairly satisfactory. The contract movement is normal. Solid caustic soda is quoted at from $2.55 to $2.60; while the flake and ground are selling at from $2.85 to $3 per 100 pounds, in drums, at works.

CHINA CLAY—The china clay market is displaying strength. Contract shipments are moving freely. Imported china clay is quoted at from $15 to $21 per ton, ship side; while domestic paper making clay is selling at from $6.50 to $12 per ton, at works.

CHLORINE—Business in the chlorine market is holding up well and the contract movement is normal for the season. Prices are generally maintained at formerly quoted levels. Chlorine is selling at from $2.15 to $2.25 per 100 pounds, in tank cars, at works.

ROSIN—The rosin market is little changed. Paper making gum rosin is now quoted at $8.15 and wood rosin at $8.20 per 280 pounds, gross weight, in barrels, at Savannah. Seventy per cent rosin size is selling at $3.68 per 100 pounds, in tank cars, at works.

SALT CAKE—Paper mill demand for salt cake is still persistent. Prices are generally steady. Salt Cake is quoted at from $12 to $13; chrome salt cake at from $11 to $12 per ton, at works; while imported salt cake is selling at from $12 to $13 per ton, ship side.

SODA ASH—The soda ash market is moderately active. Demand from the paper mills is fairly insistent. Prices are holding to former levels. Quotations on soda ash, in car lots, at works, per 100 pounds, are as follows: in bulk, $1.05; in bags, $1.20; and in barrels, $1.50.

STARCH—While demand for starch is excellent the contract movement to the paper mills is normal. Prices are steady and unchanged. Special paper making starch is now quoted at $4 per 100 pounds, in bags; and at $4.27 per 100 pounds, in barrels, at works.

SULPHITE OF ALUMINA—The sulphite of alumina market is stronger. Contract shipments are moving in good volume. Commercial grades are quoted at from $1.25 to $1.60; while iron free is selling at from $2 to $2.25 per 100 pounds, in barrels, at works.

SULPHUR—The sulphur market is steady. Yearly contracts are quoted at $18 per long ton on orders of 1,000 tons, or over and $20 on smaller quantities. On spot and nearby car loads the quotations are $21 per ton. All quotations are in car lots, at works.

TALC—Supplies of talc are moving into consumption in moderate volume. Prices are holding to schedule, in most instances. Domestic talc is quoted at from $15 to $18 per ton, at eastern mines; while imported talc is selling at from $23 to $30 per ton, on dock.

Market Quotations

Paper

Tissues—Per Ream—

White No. 1	1.10	@	—
White No. 1 M. G.	1.07½	@	—
White No. 1½	.77½	@	—
White No. 2	.75	@	—
Anti-Tarnish M. G.	.77½	@	—
Colored	.90	@	—
Kraft	.77½	@	—
Manila	.75	@	—
Unbleached Toilet	2.60	@	3.30
Bleached Toilet	3.94	@	5.26

Paper Towels—

Unbleached	2.10	@	3.35
Bleached	3.30	@	3.70

Manila—

No. 1 Jute	9.00	@	9.25
No. 2 Jute	7.75	@	8.50
No. 1 Wood	4.00	@	5.25
No. 2 Wood	3.50	@	4.00

Fibre Papers—

No. 1 Fibre	4.25	@	5.50
No. 2 Fibre	4.00	@	4.75

(Delivered New York)

News, per ton—

Roll, contract	42.50	@	—
Sheets	47.50	@	—

Kraft—

No. 1 Northern	5.25	@	5.75
Standard	5.00	@	—
Southern	5.00	@	—
Glazed	4.50	@	—
Striped	4.75	@	—

Boards, per ton—

News	47.50	@50.00
Chip	45.00	@47.50
Sgl. Mla. Ll. Chip	55.00	@60.00
Jute Lined Chip	55.00	@60.00
Kraft Liners	65.00	@67.50
White Pat. Coated	67.50	@70.00
Binders Boards	70.00	@75.00

The following are representative of distributors' resale prices:—

Rag Content Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$41.40@$48.50	$42.55@$50.00
100% Rag	32.80@ 38.50	33.95@ 39.75
85% Rag	.....	32.20@ 37.75
75% Rag	24.75@ 29.00	25.90@ 30.50
65% Rag	21.65@ 26.25	22.80@ 27.75
50% Rag	18.70@ 22.75	19.90@ 24.25
25% Rag	15.80@ 19.25	16.95@ 20.75

Regular Colors @ $1.50 cwt. extra.
Heavy Colors @ $3.00 cwt. extra

Sulphite Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$9.35@$11.50	$10.55@$12.75
No. 2	8.50@ 10.25	9.65@ 11.75
No. 4	7.60@ 9.25	8.80@ 10.75

Regular Colors @ $1.50 cwt. extra.
Heavy Colors @ $3.00 cwt. extra.

Free Sheet Book Papers—
White, Cased Paper,
Delivered in Zone 1:

No. 1 Glossy Coated	$12.45@$14.25
No. 2 Glossy Coated	10.80@ 12.25
No. 3 Glossy Coated	9.65@ 11.00
No. 4 Glossy Coated	9.05@ 10.50
No. 1 Antique (watermarked)	9.05@ 10.50
No. 2 Offset	8.35@ 9.50
A Grade E. F.	8.20@ 9.50
A Grade S. & S. C.	8.45@ 9.75
B Grade E. F.	7.60@ 8.75
B Grade S. & S. C.	7.85@ 9.00
C Grade E. F.	7.30@ 8.50
C Grade S. & S. C.	7.55@ 8.75
D Grade E. F.	7.00@ 8.25
D Grade S. & S. C.	7.25@ 8.50

Ivory & India at $.50 cwt. extra.

No. 3 White Linens	4.50	@	5.00

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—		
Moist	35.00	@36.00
Dry	40.00	@42.00

(Delivered)

No. 1 Domestic and Canadian	36.00	@37.50

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.25	@	4.65
Prime Qualities—			
Easy-Bleaching Sulphite	3.50	@	3.75
Strong Unbleached Sulphite	3.40	@	3.65

(On Dock, Atlantic Ports)

Kraft Bleached	4.00	@	4.50
Kraft Light & Strong	3.00	@	3.75
Kraft No. 1	2.90	@	3.65
Kraft No. 2	2.50	@	2.75

(F.o.b. Pulp Mill)

Kraft Domestic	3.00	@	3.25

(Delivered)

Soda Bleached	3.15	@	—

Add 60 cents per short ton, dock charges, for Albany; $2.00 for Lake Ports East and $3.00 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	9.00	@	9.25
Silesias, No. 1	6.75	@	7.00
New Unbleached	9.25	@	9.50
Blue Overall	7.50	@	8.00
Fancy	3.75	@	4.25
Washables	3.00	@	3.50
Mixed Khaki Cuttings	4.25	@	4.50
O. D. Khaki Cuttings	4.75	@	5.00

Old Rags

White, No. 1—			
Repacked	3.75	@	4.25
Miscellaneous	3.00	@	3.25
White, No. 2—			
Repacked	2.60	@	2.85
Miscellaneous	2.00	@	2.25
Thirds and Blues—			
Repacked	2.00	@	2.25
Miscellaneous	1.90	@	2.00
Roofing Rags—			
No. 1	Nominal		
No. 2	1.10	@	1.20
No. 3 (bagging)	.90	@	1.00
No. 4	.90	@	1.00
No. 5A	.75	@	.85

Foreign Rags

New Rags

New Dark Cuttings	Nominal
New Mixed Cuttings	Nominal
New Light Silesias	Nominal
Light Flannelettes	Nominal
New White Cuttings	Nominal
New Light Oxfords	Nominal
New Light Prints	Nominal

Old Rags

No. 1 White Linens	Nominal
No. 2 White Linens	Nominal
No. 3 White Linens	Nominal

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THE LOW TENSION RUBBER BELT
with equalized ply stresses.
THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.
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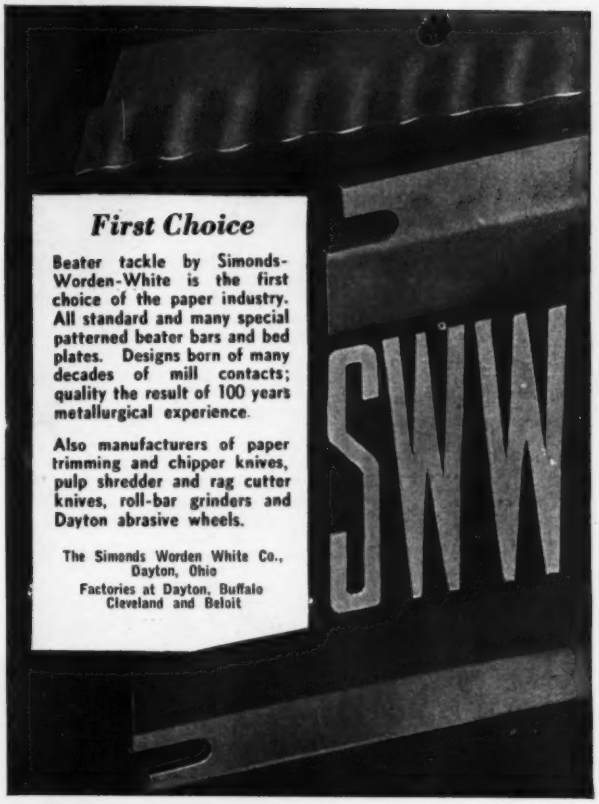

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Beater tackle by Simonds-Worden-White is the first choice of the paper industry. All standard and many special patterned beater bars and bed plates. Designs born of many decades of mill contacts; quality the result of 100 years metallurgical experience.
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Appleton Woolen Mills, Appleton, Wisconsin

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No. 4 White Linens	Nominal
No. 1 White Cotton	Nominal
No. 2 White Cotton	Nominal
No. 3 White Cotton	Nominal
No. 4 White Cotton	Nominal
Extra Light Prints	Nominal
Ord. Light Prints	Nominal
Med. Light Prints	Nominal
Dutch Blue Cottons	Nominal
French Blue Linens	Nominal
German Blue Linens	Nominal
German Blue Cottons	Nominal
Checks and Blues	Nominal
Linsey Garments	Nominal
Dark Cottons	Nominal
Old Shopperies	Nominal
New Shopperies	Nominal
French Blues	Nominal

Old Rope and Bagging

(Prices to Mill f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.25	@	2.35
Domestic	2.15	@	2.25
Wool Tares, light	1.75	@	1.85
Wool Tares, heavy	2.20	@	2.35
Bright Bagging	1.70	@	1.75
Manila Rope—			
Foreign	5.00	@	5.25
Domestic	5.25	@	—
Jute Strings	2.75	@	3.00
Sisal Strings	2.60	@	2.75
Mixed Strings	Nominal		

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.25	@	3.35
Ordinary Hard White No. 1	2.60	@	2.70
Hard White No. 2	2.50	@	2.60
Soft White No. 1	2.40	@	2.50
Flat Stock—			
Stitchless	1.40	@	1.50
Overissue Mag	1.40	@	1.50
Solid Flat Book	1.25	@	1.35
Crumbled No. 1	1.10	@	1.15
Ledger Stock	1.30	@	1.35
New B. B. Chips	.45	@	.50
Manila—			
New Env. Cut	2.25	@	2.35
New Cuttings	1.90	@	2.00
Old Kraft Machine—			
Compressed bales	1.70	@	1.80
News—			
No. 1 White News	1.50	@	1.60
Strictly Overissue	.85	@	.95
Strictly Folded	.50	@	.55
No. 1 Mixed Paper	.45	@	.50

Twines

(F. o. b. Mill)

(Soft Fibre)			
Coarse Polished—			
India	.16	@	.18½
Belg. White Hemp	.17	@	.20½
India Compress	.16½	@	.17
Fine Polished—			
Fine India	.22	@	.24
Unpolished—			
Box	.11¾	@	.12¼
Paper Makers	.11½	@	.13¾
Tube Rope	.12½	@	.15¼
Wall Paper	.13½	@	.14¾
Wrapping	.17	@	.21
Soft Fiber Rope	.14¾	@	.15¼
(Hard Fibre)			
Bond	.13½	@	.14
Anchor	.13	@	.14
Manila	.21	@	.28
Domestic	4.75	@	5.00
Transmission Rope	2.00	@	2.25
Jute Rope	2.00	@	2.25
Soft Jute Strings	2.00	@	2.50
Jute Carpet Threads	1.75	@	2.00
Gunny No. 1			
Foreign	2.40	@	2.50
Domestic	1.90	@	2.00
Bleachery Burlap	4.00	@	4.25
Scrap Burlap—			
Foreign	2.15	@	2.25
Domestic	1.90	@	2.10
Scrap Sisal	2.45	@	2.55
Scrap Sisal for Shredding	2.25	@	2.75
Wool Tares, heavy	2.30	@	2.40
New Burlap Cuttings	2.45	@	3.00
Aust. wool pouches	3.00	@	3.25
Heavy Baling Bagging	2.40	@	2.60
Paper Mill Bagging	1.75	@	1.80
Bagging No. 2	1.00	@	1.10

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.04	@	.04¼
New White No. 1	.09	@	.09¼
New White No. 2	.06¾	@	.07
New Light Flannelettes	.07½	@	—
Silesias No. 1	.07½	@	.07¾
New Black Silesias	.04¼	@	.04½
Soft Unbleached	.09¼	@	.09½
Blue Cheviot	.07¼	@	.07½
Fancy	.03¾	@	.04
Washable	.03	@	.03¼
Kraft, M. F.	6.00	@	—
Cottons—According to grades—			
Blue Overalls	.07¼	@	.07½
New Black, soft	.04¼	@	.04½
Khaki Cuttings	.04½	@	.04¾
O. D. Khaki	.04¾	@	.05
Corduroy	.03¼	@	.03½
New Canvas	.07¾	@	.08¼
B.V.D. Cuttings	.08¾	@	.09

Domestic Rags (Old)

(F. o. b. Boston)

Canvas	.04½	@	—
White No. 1—			
Repacked	—	@	2.75
Miscellaneous	2.50	@	2.75
White No. 2—			
Repacked	1.90	@	2.00
Miscellaneous	2.00	@	2.25
Twos and Blues	1.75	@	2.00
Third and Blues—			
Repacked	1.37½	@	1.75
Miscellaneous	1.25	@	1.62½
Black Stockings	3.90	@	4.00
Roofing Stock—			
No. 1	1.30	@	1.40
No. 2	1.15	@	1.20
No. 3	.90	@	1.00

Foreign Rags

(F. o. b. Boston)

Dark Cottons	1.50	@	1.60
Dutch Blues	3.00	@	3.15
New Checks and Blues	2.85	@	3.00
Old Fustians	2.50	@	2.75
Old Linsey Garments	2.10	@	2.25
New Silesias	6.50	@	7.00

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White, No. 1	.08	@	.08½
New White, No. 2	.04½	@	.05
Light Silesias	.05½	@	—
Silesias, No. 1	.04½	@	.05
Black Silesias, soft	.03½	@	.04
New Unbleached	.06	@	—
Washable, No. 1	.02	@	.02½
Blue Overall	.07	@	.07½
Cottons—According to grades—			
Washable, No. 2	.02½	@	.04½
New Blue	.02	@	.02½
Fancy	.03	@	—
New Black Soft	.04	@	.04½
New Light Seconds	.03½	@	.04
New Dark Seconds	2.00	@	2.25
Khaki Cuttings—			
No. 1 O. D.	.04	@	.04½
No. 2 Mixed	.03½	@	.04
Corduroy	.02	@	.02¼
New Canvas	.04	@	.04½
New Black Mixed	.02	@	.02¼

Domestic Rags (Old)

White No. 1—			
Repacked	4.00	@	4.50
Miscellaneous	3.00	@	3.50
Thirds and Blues—			
Miscellaneous	2.00	@	2.25
Repacked	2.50	@	2.75
Black Stockings (Export)	4.50	@	5.00
Roofing Stock—			
Foreign No. 1	2.20	@	2.25
Domestic No. 1	2.00	@	2.10
Domestic No. 2	1.90	@	2.00
Roofing Bagging	1.75	@	—

Bagging

(F. o. b. Phila.)

Gunny, No. 1—			
Foreign	2.00	@	—
Domestic	2.25	@	—
Manila Rope	4.50	@	—
Sisal Rope	3.00	@	—
Mixed Rope	1.00	@	1.10
Scrap Burlaps—			
No. 1	2.25	@	2.50
No. 2	1.00	@	1.10
Wool Tares, heavy	3.25	@	3.50
Mixed Strings	1.00	@	1.10
No. 1 New Light Burlap	3.00	@	3.50
New Burlap Cuttings	2.50	@	2.75

Old Papers

(F. o. b. Phila.)

Shavings—			
No. 1 Hard White	—	@	2.60
No. 2 Hard White	2.20	@	2.25
No. 1 Soft White	2.25	@	2.30
No. 2 Soft White	1.75	@	—
No. 1 Mixed	—	@	.65
Solid Ledger Stock	—	@	1.75
Ledger Stock, white	1.75	@	—
Ledger Stock, colored	1.50	@	—
No. 1 Books, heavy	1.10	@	1.15
Manila Cuttings	1.80	@	1.90
Print Manila	.70	@	.75
Container Manila	.65	@	—
Kraft Paper	1.75	@	—
No. 1 Mixed Paper	.50	@	.55
Straw Board Chip	.50	@	—
Binders Board Chip	.50	@	—
Corrugated Board	.70	@	.80
Overissue News	.70	@	.75
Old Newspapers	.50	@	.55

BOSTON

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White	2.20	@	2.35
No. 1 Soft White	1.85	@	2.15
No. 2 Mixed	.75	@	.80
Solid Ledger Books	1.50	@	1.75
Overissue Ledger Stock	1.30	@	1.50
Mixed Ldgers	.85	@	.90
No. 1 Books, heavy	1.10	@	1.20
No. 1 Books, light	.65	@	.75
Crumpled Stitchless Book Stock	.50	@	.60
Manila Env. Cuttings	1.60	@	1.70
Manila Env. Cuttings, extra quality	2.20	@	2.30
No. 1 Old Manila	.95	@	1.00
White Blank News	1.30	@	1.40
No. 1 Kraft	1.70	@	1.75
Mixed Papers	.42½	@	.45
Print Manila	.65	@	.75
Container Manilas	.27½	@	—
Old Newspapers	.42½	@	.45
Overissue News	.50	@	.65
Box Board Chips	.42½	@	.45
Corrugated Boxes	.72½	@	.77½
Kraft corrugated boxes	1.45	@	1.50
Screening Wrappers	.60	@	.65

Bagging

(F. o. b. Boston)

Manila Rope—			
Foreign	4.15	@	4.25

CHICAGO

Old Papers

(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope Cuttings	3.30	@	3.40
No. 1 Hard White	2.60	@	2.70
No. 1 Soft White	2.10	@	2.15
Ledger & Writings	1.40	@	1.50
Solid Books	1.25	@	1.30
Blanks	1.50	@	1.65
Krafts	1.00	@	1.25
New Kraft Cuts	1.80	@	2.00
Manila Env. Cuts	2.20	@	2.35
Ex. No. 1 Manila	2.20	@	2.35
Print Manila	1.70	@	1.80
Overissue News	.80	@	.90
Old Newspapers—			
No. 1 Folded News	.80	@	.90
No. 1 Mixed Paper	.80	@	.90
Roofing Stocks—			
No. 1	2.00	@	2.25
No. 2	1.85	@	2.00

TORONTO

Paper

Bonds and Ledgers

Delivered

No. 1 White	.35½	@	.36½
No. 1 Tints	.36½	@	.37½
No. 2 White	.26½	@	—
No. 2 Tints	.27½	@	—
No. 4 White	.15	@	.1550
No. 4 Tints	.16	@	.1650
No. 5 Bond—White	11.35	@	—
No. 5 Bond—Tints	12.35	@	—
No. 5 Bond—Golden Rod	13.35	@	—
No. 5 Ledger—White	.11½	@	—
No. 5 Ledger—Tints	.12	@	—
No. 6 Bond—White	10.75	@	—
No. 6 Bond—Tints	11.25	@	—
No. 6 Bond—Golden Rod	12.75	@	—
No. 7 Bond—White	9.10	@	—
No. 7 Bond—Tints	9.70	@	—
No. 7 Bond—Golden Rod	11.20	@	—
Book—			
No. 1 M. F.	7.10	@	7.35
No. 2 M. F.	6.85	@	7.20
No. 3 M. F.	5.60	@	6.20
No. 1 S. C.	7.60	@	7.85
No. 2 S. C.	7.00	@	7.35
No. 3 S. C.	6.10	@	6.35
No. 1 Coated and Litho	12.50	@	—
No. 2 Coated and Litho	11.00	@	—
No. 3 Coated and Litho	9.50	@	10.00
Coated tinted	13.00	@	13.50
Wrapping—delivered—			
Rag Brown	4.85	@	5.55
White Wrap	4.00	@	—
"B" Manila	4.90	@	6.25
No. 1 Manila	5.50	@	7.00
Fiber	5.50	@	—
Kraft, No. 2	5.50	@	—

(F. o. b. Cars, Toronto)

News, per ton—			
Rolls (contract)	38.50	@	—
Sheets	45.50	@	—

Pulp

Ground wood	30.00	@	31.00
Unbleached Sulphite	52.00	@	53.00
Book (Class 1)	65.00	@	66.00
Writing (Class 2)	66.00	@	67.00
Select (Class 3)	67.00	@	68.00

Old Waste Paper

(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut	2.50	@	—
Soft White	2.15	@	—
White Blk. News	1.25	@	1.40
Book and Ledger—			
Flat Magazine and Book Stock (old)	1.00	@	—
Light and Crumpled Book Stock	.85	@	—
Ledgers and Writings	1.20	@	—
Manilas—			
New Manila Cut	1.50	@	—
Printed Manilas	.70	@	—
Kraft	1.00	@	1.70
News and Scrap—			
Strictly Overissue	.75	@	—
Strictly Folded	.80	@	—
No. 1 Mixed Paper	.65	@	—

Domestic Rags

(Price to mills, f. o. b. Toronto)

No. 1 White Shirt Cuttings	.09	@	.09¼
Fancy Shirt Cuttings	.03¼	@	.04

AT PORT WENTWORTH

LOWER TAXES
PLENTY OF WORKERS
FREEDOM FROM LABOR TROUBLES
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IDEAL SITES FOR PULP OR RAYON MILLS
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The Original Chrome Nickel Alloy for the Paper Mill
HEAT - ABRASION - CORROSION RESISTING
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SALARIED POSITIONS. $2,500 to $25,000. This thoroughly organized advertising service of 27 years' recognized standing and reputation carries on preliminary negotiations for positions of the calibre indicated, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If you have actually earned over $2,500, send only name and address for details. R. W. Bixby, Inc., 117 Delward Bldg., Buffalo, N. Y.

WANTED—CHIEF ENGINEER with experience in Kraft Pulp, Paper, Board and converting operations. Must be capable of taking charge of maintenance and construction work. Location West Coast. Give brief professional history, references and salary required. Address Box 37-324, care Paper Trade Journal. J-24

SITUATIONS WANTED

POSITION WANTED as skilled all around Paper Mill MASTER MECHANIC. Installation and maintenance both cylinder and fourdrinier machines. Address Box 37-251, care Paper Trade Journal. tf

PLANT ENGINEER—Graduate engineer experienced in paper mill design, maintenance, reports and trouble cases. Both technical and a practical mechanic. Wants connection where things can be accomplished. Have executive and organizing ability and able to handle men. Address Box 37-303, care Paper Trade Journal. J-24

FOURDRINIER MACHINE TENDER or Foreman, now available. Experienced on Kraft, News or Bonds. Am steady, sober and conscientious. Go anywhere. Address Box 37-329, care Paper Trade Journal. J-24

WAXED PAPER FOREMAN—15 years' experience on all grades of paper, desires to connect with reliable concern. Best of references. Address Box 37-241, care Paper Trade Journal. tf

PAPER MILL ENGINEERING EXECUTIVE with fourteen years' experience in design, construction, maintenance and operation of pulp and paper mills and power developments, now employed, desires change of location. Address Box 37-306, care Paper Trade Journal. J-24

POSITION WANTED—TOUR BOSS or Night Boss. Have had fifteen years' experience making all grades of boards and felts. First class man on colors. Would take a job as machine tender. Prefer the West Coast. Address Box 37-325, care Paper Trade Journal. J-24

NIGHT BOSS—Thoroughly experienced Book, Bond, Index, Offset Labels; light or heavy weight specialties. Special attention to proper treatment of stock. First class fourdrinier man. Address Box 37-323, care Paper Trade Journal. J-1

SITUATIONS WANTED

PLANT SUPERINTENDENT with years' of experience in manufacture of Multi-wall Bags, sewed and pasted. Can get low cost and good quality as well as production. Will go anywhere providing good schools are available. Best of references. Address Box 37-321, care Paper Trade Journal. J-24

MECHANICAL ENGINEER—Wide experience design, maintenance, construction, wall board and heavy paper mills, special machinery and equipment. Competent designer and executive. Permanent Southern location. Now employed. Address Box 37-318, care Paper Trade Journal. J-1

POSITION WANTED—Board Mill Superintendent. Open for position July 1st. 20 years' experience on the higher grades of Cylinder paper and board. References furnished on request. Address Box 37-330, care Paper Trade Journal. J-1

ASSISTANT SUPT. CHEMIST—Eighteen years' on manufacture fine and medium writing paper and specialties. Ten years' present position. Address Box 37-332, care Paper Trade Journal. J-1

WANTED

WANTED—Coal Pulverizers, Kilns, Grinders, Oliver Filters, Sweetlands, Evaporators and Paper Machinery. CONSOLIDATED PRODUCTS CO., INC., 15-18 Park Row, New York, N. Y. J-24

FOR SALE

FOR SALE

Harper Fourdrinier Machine. trims 72". Two presses. 19 dryers 36 x 76". Two calenders. Reel. Winder. Drive.
Experimental Fourdrinier Machine 48" wire.
Moore & White Fourdrinier part, suspension type. takes a wire 80" x 50', with suction couch roll.
Dryers: 40—36" x 84".
Ream Cutters: 3 Seybolds 50" to 54".
Hamblet Cutters: 48" to 90" single; 94", 108". 136" duplex.
Approximately 1,000 calender and press rolls.
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175 Richdale Ave. Cambridge, Mass.

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BOARD MILL available for lease, with option to purchase, to responsible parties. Excellent market. Possession promptly arranged. Address Mansel L. Rankin, 257 Jackson Street, Sandusky, Ohio. J-1

BELOIT IRON WORKS PASTER for sale in first class working condition, equipped for five ply. Will use either asphalt or silicate. Width 72". Heavy duty Beloit duplex cut-off knife. Will sell cheap. Address Box 37-315, care Paper Trade Journal. J-24

FOR SALE—Plant of Hampshire Paper Company. Manufactured highest grade rag papers. Adaptable to manufacture of tissues, etc. Spring water, steam and water power. Brick buildings, steel construction. Property in excellent condition. If interested, write Frank H. Davis Co., 175 Richdale Ave., Cambridge, Mass. tf

FOR SALE—One Dillon Improved Tissue Sheet Cutter—Capacity 24 jumbo rolls—widest trimmed sheet 84" x 110 in. long. This cutter is in excellent condition. Address Box 37-320, care Paper Trade Journal. J-24

FOR SALE—50" Seybold, Latest Style Cutter in first class working order and condition. Address Box 37-331, care Paper Trade Journal. J-24

FOR SALE—$2 Bird Screen, opacity Tester, seven Roll Calender Stack having ninety-four inch rolls. Address Box 37-327, care Paper Trade Journal. J-8

BUSINESS OPPORTUNITY

EXCLUSIVE AGENCY FOR SALE—Papers, any degree of softness, strength unimpaired. Weights 24 x 36—30 to 40 x 48—200. Rope, Jute, Sulphite, Craft, Rag. Special finishes, with flexibility, elasticity, ductility, pliability, torsion strain. Added strength by Morrison or Mullen Testers. Cement, Lime, Flour sacks, Cotton factoring deep draw embossing, electrical work many specialties, both cylinder and Fourdrinier colors and duplex stock. Principals only. Address Box 37-322, care Paper Trade Journal. J-1

WANTED—BUSINESS PARTNER—Chemist with capital desires business partner having practical paper mill experience to make profitable paper specialty which he understands. Address Box 37-328, care Paper Trade Journal. J-1

MISCELLANEOUS

CLARK MANUFACTURING COMPANY, Holyoke, Mass. Telephone 2-4370. Builders of cylinder moulds, couch and felt rolls, dandy rolls. We cover dandies and cylinders tight for fast running machines. tf.

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50—new Black-Clawson dryers 48 x 60
25—new Black-Clawson dryers 24 x 60
27—new Black-Clawson dryers 60 x 164
30—new Bagley & Sewall dryers 60 x 136
22—dryers 60" x 204"
50—dryers 48" x 46"
40—dryers, Black-Clawson, 42" x 74"
109—Black-Clawson dryers 76" face, 36" diameter. 49 are double decked; 20 are mounted vertical, 5 high; balance of 40 are mounted vertical, 5 high and are 42" diameter.
300—other dryers in stock of various sizes

FOURDRINIER MACHINES

2—164" Fourdrinier machines
1—143" " machine
1—120" " "
1—118" " "
2—100" " machines
1— 92" " machine
1— 88" " "
2— 80" " machines
1— 72" " machine
—Several others

CYLINDER MACHINES

1—120" seven-cylinder machine
1—104" five-cylinder machine
1— 90" five-cylinder machine
1— 68" four-cylinder machine
1— 48" three-cylinder machine

ENGINES

1—Hamilton Corliss 22 x 42 Heavy Duty bed
1—Filer Stowell Corliss 22 x 42
1—Robt. M. Wetherill 24 x 48 x 48 Cross Compound
1—Erie Ball 14 x 25 x 20
1—Nordberg, 18 x 36 Corliss
1—Variable speed engine 8 x 10
1— " " " 10 x 12
2— " " engines 12 x 14
4— " " " 14 x 16
1—Troy vertical 12 x 14
1—Direct connected 7 x 10 engine—connected to 200 amps, 125 volt generator
1—Ridgway 13 x 16 engine, direct connected to 143 KVA-3P-60 cycle 440 volt generator.
1—Hamilton Corliss 18 x 36, direct connected to a 200 KW, 240 volt D.C. generator
1—Erie engine 15 x 15, direct connected to G.E. generator, 3 phase, 60 cycle, 220 volt.
1—Ridgway engine 20 x 24—direct connected G.E. generator, 3 phase 60 cycle, 220 volts

TURBINES

1—Terry Turbine direct connected 250 KW, 2400 volt, 3 phase, 60 cycle, 3600 RPM Allis-Chalmers generator
1—100 KW Turbine, direct connected to G.E. 3 phase 60 cycle 600 volt generator
1—100 H.P. Terry Turbine, 200 lb. steam—2000 RPM
1—Westinghouse belted Turbine, 125 HP—5150 RPM, with reducing gear to 736 RPM

MOTORS

2—5 HP—1200 RPM, 115 volt DC
1—35 HP Westinghouse type CS—3 phase 60 cycle 220 volt, 1170 RPM
1—25 HP G.E.—3 phase 60 cycle 220 volt, 1150 RPM
3—Two speed G.E. slip ring 30-15 HP, type MT—3 phase 60 cycle 440 volt, 1150 to 600 RPM
1—99% new G.E. 40 HP 3 phase 60 cycle 220 or 440 volt, 860 RPM
1—99% new G.E. 75 HP—3 phase 60 cycle 440 volt, 860 RPM
6—almost new G.E. 75 HP—3 phase 60 cycle 440 volt, 860 RPM
1—75 HP G.E. slip ring type I—3 phase 60 cycle 220 volt, 720 RPM
1—60 HP G.E. ring type I—3 phase 60 cycle 220 volt, 860 RPM
5—almost new 100 HP G.E.—3 phase 60 cycle 440 volt, 860 RPM
6—almost new 100 HP Westinghouse —3 phase 60 cycle 440 volt, 860 RPM
1—100 HP Synchronous motor, .8 PF 3 phase 60 cycle 440 volts, 600 RPM, with a 5 KW—MG set—125 volt
1—125 HP Westinghouse variable speed, 250 volt D.C.
1—almost new 125 HP G.E.—3 phase 60 cycle 220 volt, 1160 RPM
3—almost new 150 HP G.E.—3 phase 60 cycle 440 volt, 860 RPM
1—200 HP G.E.—3 phase 60 cycle 440 volts, 450 RPM. Form K
1—1250 HP Allis-Chalmers synchronous motor—3 phase 60 cycle 2300 volt—257 RPM
1—2000 HP G.E. synchronous motor —3 phase 60 cycle 2300 volt, 240 RPM
1—G.E. 200 HP, 3 phase 60 cycle, 2200 volt, type MT, form BL, 600 RPM
1—G.E. 200 HP, 3 phase 60 cycle, 2200 volt, type MT, form BL, 600 RPM
1—G.E. 50 HP, 60 cycle, 3 phase, 2200 volt, type IS, form N, speed 900 RPM
1—Westinghouse Electric 75 HP, 3 phase 60 cycle 2200 volt, type MT, Form B, speed 900 RPM
1—G.E. 150 HP, 3 phase, 60 cycle, 2200 volt, Type I, Form M, full load 575
2—G.E. 100 HP, 3 phase 60 cycle, 2200 volt, Type I, Form M, full load 575
1—Westinghouse 40 HP, EMF 550, 3 phase, amps 45, full load 850, alts. 7200, Type C
1—Westinghouse 40 HP, size 104, EMF 550, 3 phase, no load speed 900, alts. 7200, Type F
500—other motors

MISCELLANEOUS

6—Almost new Erkensators
1—42" 4-roll calender stack
3—Fritz Hydrators

1—111" Hamblet duplex cutter
1— 97" Hamblet single cutter
1— 72" Hamblet single cutter
1—53" Hamblet single cutter
1—90" Moore & White cutter
7—ream cutters, various sizes
2—78" Erie layboys
2—72" Moore & White layboys
2—48" Moore & White layboys

1—Skinner Bros. Baetz Patent Air Heater, size #448
1—Ross heater, size #553

4—Jones Imperial Jordans
2—Noble & Wood Mammoth Jordans almost new
1—Miami #7 jordan
1—Miami #1 jordan
2—Miami #2 jordans
2—small Horne jordans
1—new Bahr Bros. plug for Black-Clawson #3 jordan
1—Almost new Bolton bandless plug for Noble & Wood Mammoth Jr. jordan engine.
1—Almost new Bolton bandless plug for Miami #1 jordan engine
2—new Bahr Bros. plugs for Noble & Wood Monarch jordan
1—new head and thrust bearing for Black-Clawson #2
1—jordan plug for Black-Clawson #3

1—Tile-lined beater, bronze fitted, roll 32" face x 44" dia.
1—Allen mixer
1—Neptune water meter with 6" inlet and outlet

1—Ohio baler
1—Hesse Ersted high compression baler
1—Williams Pulverizer with blower
3—Jeffrey Hammermill shredders
1—wing duster

2—American Ball variable speed engines, 12 x 10
1—Fulton condensor 4 x 160, type FH
12—extra heavy lineshaft hangers, 3-15/16"
2—Crane tilt type "C" steam traps, 3" inlet
1—type "B" Crane tilt trap, 1¼" inlet

Lot of first aid equipment
1—Turbine driven centrifugal pump—2000 GPM 110' head
1—Turbine driven boiler feed pump
1—10 x 20 Shartle duplex stuff pump
2—10 x 20 Beloit duplex stuff pumps
2— 8 x 16 Downingtown duplex stuff pumps
1— 8 x 16 Shartle duplex stuff pump
1—10 x 12 Black-Clawson duplex stuff pump
1— 7 x 16 Shartle duplex stuff pump
1— 8 x 16 Shartle single stuff pump
3—12 x 12 Bagley & Sewall triplex stuff pumps
1— 8 x 18 Shartle triplex stuff pump
1—#7 Nash vacuum pump
1—10 x 12 vacuum pump
1—14 x 20 vacuum pump

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Improved Paper Mchy. Corp.
International Nickel Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
The Richardson Co.
Simonds-Worden-White Co.
Stowe-Woodward, Inc.

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E. I. du Pont de Nemours & Co.
Geigy Co., The
General Dyestuff Corp.
Heller & Merz
National Aniline & Chemical Co.
N. Y. Color & Chemical Co.
Paper Makers Chemical Co.
C. K. Williams & Co.

ELECTRIC EQUIPMENT
Allis-Chalmers Mfg. Co.
Chicago Electric Co.
General Electric Co.

EMBOSSING MACHINES
Hudson Sharp Machine Co.
Paper Converting Machine Co.
John Waldron Corp.

EMBOSSING ROLLS
The Appleton Machine Co.
Hudson Sharp Machine Co.
B. F. Perkins & Son, Inc.
Roehlen Engraving Works, Inc.
The Textile Finishing Machy. Co.
Waldron Corporation, John

EVAPORATORS
Swenson Evaporator Co.
Traylor Engrg. & Mfg. Co.

EXTRACTORS
Bird Machine Company
Downingtown Manufacturing Co.
Valley Iron Works Co.

FANS
Duriron Company
General Electric Co.
B. F. Perkins & Son, Inc.
Propellair, Inc.
Ross Engineering Co., J. O.

FAN CONTROLS (Ventilating)
The Bristol Company
The Brown Instrument Co.
The Foxboro Company
Minneapolis-Honeywell Co.

FEEDERS
Traylor Engrg. & Mfg. Co.

FELT CARRIER ROLLS
American Wringer Co.
Appleton Machine Co.
Beloit Iron Works
Black-Clawson Company
The Cincinnati Rubber Mfg. Co.
Downingtown Mfg. Co.
Goodrich Rubber Co., B. F.
Rodney Hunt Machine Co.
Shartle Brothers Machine Co.
Stowe-Woodward, Inc.
Valley Iron Wks.

FELT CLEANERS
Magnus Chemical Co.

FELT CONDITIONERS
Bird Machine Company

FELT CONDITIONER PLATE
The Richardson Co.

FELTS
Appleton Woolen Mills
Asten-Hill Mfg. Co.
Bulkley Dunton Pulp Co., Inc.
Castle & Overton, Inc.
Draper Bros. Co.
Huyck & Son, E. C.
Knox Woolen Co.
Lockport Felt Co.
Mt. Vernon-Woodberry Mills, Inc.
Orr Felt & Blanket Co.
Shuler & Benninghofen
Waterbury Felt Co.

FELT GUIDES
Gilbert & Nash Co.
Moore & White Co.
Shartle Brothers Machine Co.
John Waldron Corp.

FELT TIGHTENER (Automatic)
John Waldron Corp.

FELT WHIPPER BARS
The Richardson Co.

FILTERS
Improved Paper Mchy. Corp.
Moore & White Co.
Norwood Engrg. Co.
Oliver United Filters Inc.
J. O. Ross Engrg. Corp.
Stebbins Engrg. & Mfg. Co.
Swenson Evaporator Co.

FILTER CLEANERS
Magnus Chemical Co.

FILTER WIRES
Chase Brass & Copper Co.
International Nickel Co.

FITTINGS, Pipe (Plain end or flanged)
American Cast Iron Pipe Co.
Crane Co.
Duriron Company
Michigan Steel Castings Co.
Walworth Company

FLANGED FITTINGS
American Cast Iron Pipe Co.
Chase Brass & Copper Co.
Crane Company
Duriron Company
Walworth Company

FLEXIBLE COUPLINGS
Beloit Iron Works
Black-Clawson Company
De Laval Steam Turbine Co.
The Frederick Iron & Steel Co.
Link-Belt Co.
Shartle Brothers Machine Co.
John Waldron Corp.
T. B. Wood's Sons

FLEXIBLE SLICE
E. D. Jones & Sons Co.

FLOORING
Goodrich, B. F. Rubber Co.
Hendrick Mfg. Co.
Norton Co.
Stebbins Engrg. & Mfg. Co.

FLOW METERS
Bristol Co., The
The Brown Instrument Co.
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.

FLY BARS
Black-Clawson Company
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Jones & Sons Co., E. D.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Simonds-Worden-White Co.

FOAM ELIMINATION
J. B. Calva & Co.

FOLDING ENDURANCE TESTERS
Testing Machines, Inc.

FOLDING MACHINES
Hamblet Machine Co.
Hudson Sharp Machine Co.
Norwood Eng. Co.
Paper Converting Machine Co., Inc.
Waldron, John, Corp.

FORMING MACHINES
Downingtown Mfg. Co.
Shartle Brothers Machine Co.

FOURDRINIER MACHINES
Beloit Iron Works
Black-Clawson Company
Davis, Frank H., Co.
Downingtown Mfg. Co.
Moore & White Co.
Pusey & Jones
Shartle Brothers Machine Co.
Smith & Winchester

FOURDRINIER WIRES
Appleton Wire Works
Castle & Overton
International Wire Works
Lindsay Wire Weaving Co.
Purves Machine Wire Co.
Sinclair Co.

WHERE TO BUY

FREENESS RECORDERS
Trimbey Machine Works
FREENESS TESTERS
Testing Machines, Inc.
FREQUENCY RECORDERS
The Bristol Company
Leeds & Northrup Company
FURNACE PRESSURE (Draft) Control
The Bristol Company
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
GALVANOMETERS
Leeds & Northrup Company
GAS ANALYSIS EQUIPMENT (SO^2 and CO^2 Recorders)
The Foxboro Company
Leeds & Northrup Company
GAS BURNER CONTROLS (Automatic Systems)
The Brown Instrument Co.
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
GATES (Canal)
Rodney Hunt Machine Co.
GATES (Sluice)
Rodney Hunt Machine Co.
GEARS
Beloit Iron Works
Black-Clawson Company
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
Improved Paper Mchy. Corp.
E. D. Jones & Sons Co.
Link-Belt Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Richardson Co.
Shartle Brothers Machine Co.,
Smith & Winchester Mfg. Co.
John Waldron Corp.
GEAR BLANKS
The Richardson Co.
GENERATORS
Allis Chalmers Mfg. Co.
Chicago Electric Co.
De Laval Steam Turbine Co.
General Electric Co.
GLASS ELECTRODE (Coleman)
W. A. Taylor & Co., Inc.
GRANITE ROLLS
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co
Perkins & Son, Inc., B. F.
GRAPPLES
The American Mono Rail Co.
J-B Engineering Sales Co.
GRINDERS
Covel-Hanchett Co.
GRATING (Sidewalk)
Hendrick Mfg. Co.
GRINDING WHEELS
Norton Co.
The Manhattan Rubber Mfg Division of Raybestos-Manhattan, Inc.
Seybold Machine Co.
Simonds-Worden-White Co.
GUMMED TAPE TESTERS
Thwing-Albert Instrument Co.
HAMMERS (Soft Faced)
Greene, Tweed & Co.
HAND CLEANERS
Magnus Chemical Co.
HANGERS
Crane Co.
Link Belt Co.
Walworth Co.
T. B. Wood's Sons Co.
HEATERS
Fibre Making Processes, Inc.
D. J. Murray Mfg. Co.
J. O. Ross Engrg. Corp.
HEAT EXCHANGERS
Duriron Company
HEATING AND VENTILATING SYSTEMS
Crane Co
J. E. Singer
Ross Engineering Corp., J. O.
Stickle Steam Specialties Co.
HEAT-TREATING FURNACES
Leeds & Northrup Company
HIGH DENSITY THICKENERS
Shartle Brothers Machine Co.,

HOISTS
Allis Chalmers Mfg. Co.
The American Mono Rail Co.
Appleton Machine Co.
General Electric Co.
E. D. Jones & Sons Co.
Link Belt Co.
HOISTS (Gate)
Rodney Hunt Machine Co.
HOSE (Air, Water, Suction, etc.)
The Cincinnati Rubber Mfg. Co.
Goodrich Rubber Co.
Manhattan Rubber Mfg. Co
HUMIDITY RECORDERS
The Bristol Company
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
HYDRAULIC MACHINERY
Farrel-Birmingham Co.
INDICATORS
The Bristol Co.
The Brown Instrument Co.
The Foxboro Company
General Electric Co.
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
Taylor Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
INTERFOLDING MACHINES
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.
John Waldron Corp.
INSTRUMENTS
Bowsher, N. P.
The Bristol Co.
The Brown Instrument Co.
The Foxboro Company
R. Fuess, Inc.
General Electric Co.
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co
Taylor Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Williams Apparatus Co.
JORDANS
The Appleton Machine Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.,
Smith & Winchester Mfg. Co.
Valley Iron Works
JORDAN FILLINGS
Appleton Machine Co.
Davis, Frank H., Co.
Bahr Bros. Mfg. Co., The
International Nickel Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.,
Simonds-Worden-White Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
JORDAN PLUGS
Bahr Brothers
KILNS
Traylor Engrg. & Mfg. Co.
K MONEL
International Nickel Co.
KNIVES (Multi V. Drives)
Shartle Brothers Machine Co.,
KNIVES
Beloit Iron Wks.
Dilts Machine Works, Inc.
Hamblet Machine Co.
J. W. S. Trading Co., Inc.
E. D. Jones & Sons Co.
Simonds Worden White
Taylor, Stiles & Co.
Valley Iron Wks.
LABELLING MACHINES
Potdevin Machine Co.
LABORATORY EQUIPMENT
Appleton Machine Co.
Dilts Machine Wks.
E. D. Jones & Sons Co.
Leeds & Northrup Company
Noble & Wood Machine Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Valley Iron Works
Williams Apparatus Co.
LATHES
Montague Machine Co.
LAY BOYS
Hamblet Machine Co.
Moore & White Co.
LEVELERS
National Oil Products Co.
LIGHTS
Portable Light Company
LIQUID LEVEL RECORDERS
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
LIME MUD FILTERS
Oliver United Filters, Inc.
LITHOPONE
Chemical & Pigment Co.
New Jersey Zinc Co.
LOAD (Electrical) Control
Leeds & Northrup Company
LOFT DRYERS
Ross Engineering Corp., J. O.
John Waldron Corp.
Valley Iron Wks.
LUBRICANTS
Gulf Refining Co.
Standard Oil Co. of Indiana
Tide Water Associated Oil Co.
MAGNIFIERS (Pocket)
Bausch & Lomb Optical Co.
R. Fuess, Inc.
MARKING BANDS (Rubber)
Stowe-Woodward, Inc.
MEASURING INSTRUMENTS
The Bristol Company
Leeds & Northrup Company
METERS
The Bristol Co.
The Brown Instrument Co.
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
Thwing Instrument Co.
METERING & PROPORTIONING SYSTEMS
The Bristol Company
The Brown Instrument Co.
The Foxboro Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
Trimbey Machine Works
MICROMETERS
Farrel-Birmingham Co.
Lobdell Carwheel Co.
Montague Machine Co.
Testing Machines, Inc.
MICRO-PROJECTORS
Bausch & Lomb Optical Co.
MICROSCOPES
Bausch & Lomb Optical Co.
R. Fuess, Inc.
Testing Machines, Inc.
MONEL METAL (Covered Rolls)
The International Nickel Co.
MONEL METAL (Rolled Forms)
The International Nickel Co.
MONO RAIL SYSTEMS
The American Mono Rail Co.
MOTORS
Allis-Chalmers Mfg. Co.
Chicago Electric Co.
General Electric Co.
NAPKIN FOLDING MACHINE
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.
Waldron, John, Corp.
NICKEL CHROMIUM STEEL
Duriron Company
NICKEL-CLAD STEEL
The International Nickel Co.
NICKEL IRON ALLOYS
Duriron Company
The International Nickel Co.
NI-RESIST CAST IRON
The International Nickel Co
OILLESS BEARINGS
The Richardson Co.
OPACIFYING PIGMENT
Chemical & Pigment Co.
New Jersey Zinc Co.
Titanium Pigment Co.
R. T. Vanderbilt Co.
PACKAGING MACHINES
Hudson Sharp Machine Co.
PACKING
Cincinnati Rubber Mfg. Co.
Goodrich, B. F. Rubber Co.
Manhattan Rubber Co.
Rhoads, J. E. Sons
Stebbins Engrg. & Mfg. Co.
PACKING (Specially Treated to Caustic Soda and Alkalies)
Greene, Tweed & Co.
PACKAGING (Rubber)
B. F. Goodrich Rubber Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
PANZL STRAINERS
Duriron Company
PAPER BAG MACHINERY
Potdevin Machine Co.
Smith & Winchester Mfg. Co.
Shartle Brothers Machine Co.,
Strachan & Henshaw, Ltd.
Weber, Herman G.
PAPER BREAK RECORDERS
The Foxboro Company
Thwing-Albert Instrument Co.
PAPER CUTTERS
Black-Clawson Company
Davis, Frank H., Co.
Downingtown Mfg. Co.
Hamblet Machine Company
Moore & White Co.
Seybold Machine Co.
Shartle Brothers Machine Co.,
Smith & Winchester Mfg. Co.
PAPER MACHINE APRONS
Goodrich Rubber Co., B. F.
PAPER MACHINE DRIER CONTROL SYSTEMS
The Bristol Company
The Brown Instrument Co.
The Foxboro Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
PAPER MANUFACTURERS
West Virginia Pulp & Paper Co.
PAPER MACHINE HOODS
Ross Engineering Corp., J. O.
PAPER MACHINE SLICES
Beloit Iron Works
Black-Clawson Company
E. D. Jones & Sons Co.
Montague Machine Co.
PAPER ROLLS
B. F. Perkins & Son, Inc.
The Textile Finishing Machy. Co.
Waldron Corp., John
PAPER SCALES
Testing Machines, Inc.
Thwing-Albert Instrument Co.
PAPER TESTERS
R. Fuess, Inc.
Perkins & Son, Inc., B. F.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Valley Iron Works Co.
Williams Apparatus Co.
PAPER TUBE MACHINERY
Dietz Machine Works
Langston Co., Samuel M.
PAPER WAXING MACHINERY
Potdevin Machine Co.
Shartle Brothers Machine Co.,
Strachan & Henshaw, Ltd.
Waldron, Corp., John
PASTING MACHINES
Black-Clawson Company
Beloit Iron Works
Davis, Frank H., Co.
Moore & White Co.
Murray, D. J., Mfg. Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.,
John Waldron Corp.
Weber, Herman G.
PENESCOPE PENETRATION TESTER
Thwing-Albert Instrument Co.
PENSTOCKS
Rodney Hunt Machine Co.
PERFORATING MACHINES
Dietz Machine Works
Waldron John, Corp.
PERFORATED METAL
Chase Brass & Copper Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
pH Control (Automatic)
Leeds & Northrup Company
pH CONTROL
Leeds & Northrup Company
W. A. Taylor Co.
Wallace & Tiernan, Co., Inc.
pH TESTERS
Leeds & Northrup Company
W. A. Taylor & Co., Inc.
Wallace & Tiernan, Co., Inc.
Wilkens-Anderson Co.
PHOSPHATE CONTROL EQUIPMENT (Boiler Water)
W. A. Taylor & Co., Inc.
PILLOW BLOCKS
Link Belt Company
T. B. Wood's Sons Co.
PIPE
Chase Brass & Copper Co.
Duriron Company.
The International Nickel Co.
PIPE (Cast Iron)
American Cast Iron Pipe Co.
PIPE (Stainless)
Mundt & Sons, Charles
PIPE (Wood)
Wyckoff, A., & Son
PIPING
Crane Co.
Goodrich, B. F. Rubber Co.
International Nickel Co.
Mundt & Sons, Charles
J. E. Singer
Walworth Co.
PIPING (Cast Iron)
American Cast Iron Pipe Co.
PLATES (Filter)
J. E. Singer
Stebbins Engrg. & Mfg. Co.
PLATING, CHROMIUM
Chromium Corp. of America
PLATERS
Perkins & Son, Inc., B. F.
PLAYING CARD MACHINERY
Waldron, John, Corp.
PLUGS (Jordan)
Black-Clawson Company
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.
PLUGS
E. D. Jones & Sons Co.
POTENTIOMETERS
Leeds & Northrup Company
W. A. Taylor & Co., Inc.
POWER TRANSMISSION EQUIPMENT
Allis Chalmers Mfg. Co.
Beloit Iron Works
Black-Clawson Company
De Laval Steam Turbine Co.
Farrel-Birmingham Co.

WHERE TO BUY

Link-Belt Co.
Moore & White Co.
Murray, D. J.
T. B. Wood's Sons

PRECISION INSTRUMENTS
The Bristol Co.
Brown Instrument Co.
The Foxboro Company
R. Fuess, Inc.
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Taylor Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Williams Apparatus Co.

PRESSES
Black-Clawson Company
Farrel-Birmingham Co.
Fibre Making Processes, Inc.
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Valley Iron Wks.
Waldron Corp., John

PRESSES (Dual Suction)
Beloit Iron Works

PRESS ROLLS
American Wringer Co., Inc.
Beloit Iron Works
Black-Clawson Company
The Cincinnati Rubber Mfg. Co.
Downingtown Mfg. Co.
Goodrich Rubber Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
Pusey & Jones Corp.
Rodney Hunt Machine Co.
Stowe-Woodward, Inc.
Valley Iron Works Co.

PRESS ROLLS (Granite)
Beloit Iron Works
Perkins & Son, Inc., B. F.

PRESSURE BULKERS
B. F. Perkins & Sons, Inc.

PRINTING PRESSES
Harris Seybold Potter Co.
Hudson Sharp Machine Co.
Potdevin Machine Co.
Paper Converting Machine Co., Inc.
Strachan & Henshaw, Ltd.
John Waldron Corp.
Weber, Herman G.

PULLEYS
Beloit Iron Wks.
Black-Clawson Company
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
E. D. Jones & Sons Co.
Link-Belt Co.
Montague Machine Co.
D. J. Murray Mfg. Co.
Shartle Brothers Machine Co.,
Valley Iron Wks.
T. B. Wood's Sons

PULPSTONES
Norton Co.

PULPS
Andersen Co., J.
Bulkley Dunton Pulp Co., Inc.
Castle & Overton, Inc.
Gottesman & Co., Inc.
Johaneson, Wales & Sparre, Inc.
Lagerloef Trading Co.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.

PULPERS
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.,

PULP MACHINERY
Bird Machine Company
Fibre Making Processes, Inc.
E. D. Jones & Sons Co.
D. J. Murray Mfg. Co.
Stebbins Engrg. & Mfg. Co.

PULP MILL MACHINERY
Midwest-Fulton Machine Co.

PULP SCREENS
Bird Machine Company
Fibre Making Processes, Inc.
D. J. Murray Mfg. Co.
Trimbey Machine Works

PULP THICKENERS
Bird Machine Company
Downingtown Mfg. Co.
D. J. Murray Mfg. Co.
Moore & White Co.
Shartle Brothers Machine Co.,

PULP WASHERS
Oliver United Filters, Inc.

PULP WOOD MACHINERY
Montague Machine Co.

PULPWOOD STACKERS
Link Belt Co.

PUMP PRIMERS (Steam and Water Jet)
Valley Iron Works Co.

PUMPS, VACUUM
Midwest-Fulton Machine Co.

PUMP VALVE BALLS (Rubber)
Stowe-Woodward, Inc.

PUMPS
Allis-Chalmers Co.
Beloit Iron Works
Black-Clawson Company
Buffalo Pumps, Inc.
The Brown Instrument Co.
Chicago Electric Co.
Davis, Frank H., Co.
Downingtown Mfg. Co.
Duriron Company
Economy Pumping Machinery Co.
Fibre Making Processes, Inc.
Frederick Iron and Steel Co.
De Laval Steam Turbine Co.
Minneapolis-Honeywell Co.
Moore & White Co.
Morris Machine Works
Nash Engineering Co.
Oliver United Filters Inc.
Shartle Brothers Machine Co.,
Smith & Winchester Mfg. Co.
Valley Iron Works
Warren Steam Pump Co.

PYROMETERS (Roll)
The Bristol Co.
The Brown Instrument Co.
The Foxboro Company
Leeds & Northrup Company
Minneapolis-Honeywell Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

RAG CUTTERS
Perkins & Son, Inc., B. F.
Taylor Stiles & Co.

REAM COUNTERS
Hamblet Machine Co.

REBUILT MOTORS
Chicago Electric Co.
Shartle Brothers Machine Co.,

REBUILT PAPER MACHINERY
Davis, Frank H., Co.

RECORDING INSTRUMENTS
The Bristol Co.
The Brown Instrument Co.
The Foxboro Company
General Electric Co.
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
Taylor Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Trimbey Machine Wks.

RECOVERY SYSTEMS
Fibre Making Processes, Inc.
D. J. Murray Mfg. Co.
Pusey & Jones
Ross Engineering Corp., J. O.
Stebbins Eng. & Mfg. Co.
Swenson Evaporator Co.

REELS
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Hudson Sharp Machine Co.
Moore & White Co.
Rodney Hunt Machine Co.
Shartle Brothers Machine Co.,

REFINERS
Appleton Machine Co.
Bahr Bros.
E. D. Jones & Sons Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.,
Valley Iron Wks.

REFRACTORIES
Norton Co.

REGULATORS
The Bristol Co.
The Brown Instrument Co.
The Foxboro Company
General Electric Co.
Leeds & Northrup Company
Link Belt Company
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
Taylor Instrument Co.
Trimbey Machine Works

REWINDERS
Black-Clawson Company
Potdevin Machine Co.

ROD MILLS
Allis-Chalmers Co.
Mine & Smelter Supply Co.
Murray, D. J. Mfg. Co.
Traylor Engrg. & Mfg. Co.

ROLLS (Brass and Copper)
Black-Clawson Company
Chase Brass & Copper Co.
Shartle Brothers Machine Co.,

ROLLS (Bronze)
Rodney Hunt Machine Co.

ROLLS (Chilled Iron & Gray Iron)
Black-Clawson Company
Davis, Frank H., Co.
Farrel-Birmingham Co.
Improved Paper Mchy. Corp.
Lobdell Car Wheel Co.
Shartle Brothers Machine Co.,
Smith & Winchester Mfg. Co.
Valley Iron Works

ROLLS (Rubber or Rubber Covered)
American Wringer Co.
Beloit Iron Works
Black-Clawson Company
The Cincinnati Rubber Mfg. Co.
Davis, Frank H., Co.
B. F. Goodrich Rubber Co.
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
Shartle Brothers Machine Co.,
Rodney Hunt Machine Co.
Stowe-Woodward, Inc.

ROLLS (Wooden)
Rodney Hunt Machine Co.

ROLL GRINDERS
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Simonds-Worden-White Co.

ROLL SLITTING MACHINES
Cameron Machine Co.
Langston Co., Samuel M.
Potdevin Machine Co.

ROLL STANDS
Cameron Machine Co.
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.,

ROLL WINDING MACHINES
Cameron Machine Co
Potdevin Machine Co.

ROOFING
J. E. Singer

ROPE DRIVES
Allis-Chalmers Mfg. Co.

ROTARY COOLERS
Traylor Engrg. & Mfg. Co.

ROTARY DRYERS
Traylor Engrg. & Mfg. Co.

ROTARY KILNS
Traylor Engrg. & Mfg. Co.

RUBBER COVERING
Cincinnati Rubber Mfg. Co.
Manhattan Rubber Mfg. Co.
The Richardson Co.
Stowe Woodward, Inc.

RUBBER MOLDS
The McNeil Mch. & Engrg. Co.

SALT
Pennsylvania Salt Mfg. Co.
Solvay Sales Co.

SALT CAKE
Gottesman Co.
Johaneson, Wales & Sparre, Inc.
Pennsylvania Salt Mfg. Co.

SATURATING MACHINES
Beloit Iron Wks.
Black-Clawson Company
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.,
Waldron, John, Corp.
Weber, Herman G.

SAVEALLS
Bird Machine Company
Castle & Overton, Inc.
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Moore & White Co.
Oliver United Filters, Inc.
The Richardson Co.
Shartle Brothers Machine Co.,

SCALES
Testing Machines, Inc.
Thwing-Albert Instrument Co.

SCORE TESTERS
Testing Machines, Inc.
Thwing-Albert Instrument Co.

SCREEN DIAPHRAGMS
The Cincinnati Rubber Mfg. Co.
Goodrich Rubber Co., B. F.
E. D. Jones & Sons Co.
Manhattan Rubber Mfg. Co.

SCREENS
Appleton Wire Works
Beloit Iron Works
Bird Machine Company
Davis, Frank H., Co.
Downingtown Mfg. Co.
Fibre Making Processes, Inc.
Harrington & King Perforating Co.
Hendrick Manufacturing Co.
International Wire Works
Improved Paper Mchy. Corp.
E. D. Jones & Sons Co.
Link-Belt Co.
Montague Machine Co.
Moore & White Co.
Charles Mundt & Sons
D. J. Murray Mfg. Co.
Shartle Brothers Machine Co.,
Valley Iron Works Co.

SCREEN PLATE
Bird Machine Company
E. D. Jones & Sons Co.
D. J. Murray Mfg. Co.
Hendrick Mfg. Co.
Improved Paper Mchy. Corp.
Shartle Brothers Machine Co.,

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SHAFTS, COLLAPSIBLE WINDOWS
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SHAFT COUPLINGS
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Moore & White

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Strachan & Henshaw, Ltd.
Williams Apparatus Co.

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J. E. Singer

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T. B. Wood's Sons Co.

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Philadelphia Quarts Co.

SIZING
American Cyanamid & Chemical Co.
Bennett, Inc.
Paper Makers Chemical Corp.
National Oil Products

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American Delthirna Corp.
Bennett, Inc.
J. B. Calva & Co.
National Oil Products Co.
Ross Engrg. Corp., J. O.

SIZING SYSTEM
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Bulkley Dunton Pulp Co., Inc.

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Wallace & Tiernan, Co., Inc.

SLIME REMOVER
Magnus Chemical Co.

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Downingtown Mfg. Co.
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SO_2 RECORDERS
Leeds & Northrup Company

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Columbia Alkali Corp.
Johaneson, Wales & Sparre, Inc.
Mathieson Alkali Works, Inc.
Paper Makers Chemical Corp.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.

SOAP POWDER
Magnus Chemical Co.
Paper Makers Chemical Corp.

SODIUM METASILICATE
Philadelphia Quarts Co.

SODIUM SULPHATE
Johaneson, Wales & Sparre, Inc.
Pennsylvania Salt Mfg. Co.

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Johnasson, Wales & Sparre, Inc.

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Davis, Frank H., Co.
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Hamblet Machine Co.
Hudson Sharp Machine Co.
E. D. Jones & Sons Co.
Montague Machine Co.
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Potdevin Machine Co.
Rodney Hunt Machine Co.
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Strachan & Henshaw, Ltd.
John Waldron Corp.

SPECIALTY DEVELOPMENT
J. B. Calva & Co.

SPEED INDICATING RECORDERS
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The Foxboro Company
Leeds & Northrup Company

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Beloit Iron Works
De Laval Steam Turbine Co.
Farrel-Birmingham Co.
Link-Belt Co.
Moore & White Co.
Rodney Hunt Machine Co.

SPROCKETS
Improved Paper Mchy. Corp.
Link Belt Co.

STAIR and FLOOR TILES—(Non-Slip)
Norton Company

STAIR TREADS
Hendrick Mfg. Co.
Norton Company

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Clinton Co.

STEAM SPECIALTIES
Crane Co.
Stickle Steam Specialties Co.

STEEL (Electric Furnace Open Hearth)
Timken Roller Bearing Co.

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Link-Belt Co.
Ross Engrg. Corp., J. O.

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Link Belt Co.
Swenson Evaporater Co.

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Moore & White Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.,
Stearns, A. T., Lumber Co.
Valley Iron Works Co.
G. Woolford Wood Tank Mfg. Co.

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Buffalo Pumps, Inc.
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
The Frederick Iron & Steel Co
Moore & White Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.,
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Warren Steam Pump Co.

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Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.,
Trimbey Machine Co.

SUCTION BOX COVERS
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Gilbert & Nash
E. D. Jones & Sons Co.
Moore & White Co.
The Richardson Co.
Shartle Brothers Machine Co.,

SUCTION ROLLS
American Wringer Co.
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.

SULPHUR
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Texas Gulf Sulphur Co.

SULPHUR BURNERS
Chemi. Pulp Process
Valley Iron Wks.

SUPER CALENDERS
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Goodrich Rubber Co., B. F.
Lobdell Car Wheel Co.
Manhattan Rubber Mfg. Co.
Moore & White Co.
Norwood Engrg. Co.
Perkins & Son, Inc., B. F.
Smith & Winchester Mfg. Co.
Stowe-Woodward, Inc.
The Textile Finishing Machy. Co.

TABLE ROLLS
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Beloit Iron Works
Black-Clawson Company
Rodney Hunt Machine Co.
The Cincinnati Rubber Mfg. Co.

TACHOMETERS
The Brown Instrument Co.
The Bristol Co.
The Foxboro Company
Leeds & Northrup Company
Minneapolis-Honeywell Co.
Testing Machines, Inc.

TANKS
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E. D. Jones & Sons Co.
Kalamazoo Tank & Silo Co.
The Manhattan Rubber Mfg.
J. O. Ross Engrg. Corp.
Stearns, A. T., Lumber Co.
Stebbins Engrg. & Mfg. Co.
Traylor Engrg. & Mfg. Co.
G. Woolford Wood Tank Mfg.

TANKS (Wood)
Rodney Hunt Machine Co.

TEAR TESTERS
Testing Machines, Inc.
Thwing-Albert Instrument Co.

TELEMETERS
The Bristol Company
The Foxboro Company
Leeds & Northrup Co.
Mason-Neilan Regulator Co.

TELETYPE MACHINES
American Tel. & Tel. Co.

TEMPERATURE RECORDERS
The Bristol Co.
The Foxboro Company
R. Fuess, Inc.
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Taylor Instrument Co.
Testing Machines, Inc
Thwing-Albert Instrument Co.

TENSILE TESTERS
Perkins & Son, Inc., B. F.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

TESTERS (Bursting Strength)
Testing Machines, Inc.
Perkins & Son, Inc., B. F.

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W. A. Taylor & Co., Inc.
Thwing-Albert Instrument Co.
Wallace & Tiernan, Co., Inc.
Wilkens Anderson Co.

TESTERS (Smoothness)
R. Fuess, Inc.
Williams Apparatus Co.

TESTERS (Stiffness)
R. Fuess, Inc.
Testing Instruments, Inc.
Thwing-Albert Instrument Co.

TESTING INSTRUMENTS (Thickness Test)
Testing Machines, Inc.

TESTING INSTRUMENTS (Basis Weights)
R. Fuess, Inc.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

TESTING LABORATORY
J. B. Calva & Co.
E. I. du Pont de Nemours & Co., Inc.

THICKENERS
Bird Machine Company
Dorr Co.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Moore & White
D. J. Murray Mfg. Co.
Oliver United Filters, Inc.
Shartle Brothers Machine Co.,

TITANIUM PIGMENT
Chemical & Pigment Co.
Titanium Pigment Co.
R. T. Vanderbilt Co.

TIE RODS
International Nickel Co.

TOILET FOLDING MACHINES
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.

TOILET WINDERS
Cameron Machine Co.
Dietz Machine Works
Hudson Sharp Machine Co.

TOWEL FOLDING MACHINES
Paper Converting Machine Co., Inc.
Waldron Corp., John

TOWEL INTERFOLDING MACHINES
Dietz Machine Works
Hudson Sharp Machine Co.

TOWEL WINDER
Cameron Machine Co.
Hudson Sharp Machine Co.
Waldron Corp., John

TOWERS
Cameron Machine Co.
Hudson Sharp Machine Co.
Stebbins Engrg. & Mfg. Co
Waldron Corp., John

TRANSMISSION MACHINERY
Beloit Iron Works
Black-Clawson Company
De Laval Steam Turbine Co.
Farrel-Birmingham Co.
Link-Belt Co.
Shartle Brothers Machine Co.,
Timken Roller-Bearing Co.
T. B. Wood's Sons

TRAPS (Steam)
Crane Co.

TROLLEYS
The American Mono Rail Co.

TRUCKS
Baker-Raulang Co.
Moore & White Co.
Towmotor, Inc.

TUBES (Paper)
Elixman Paper Core Co.
Sonoco Products Co.

TUBING
Chase Brass & Copper Co.
The International Nickel Co
The Richardson Co.
Timken Roller Bearing Co.

TUBS (Wood)
De Laval Steam Turbine Co.
Rodney Hunt Machine Co.
Stearns, A. T., Lumber Co.
G. Woolford Wood Tank Mfg. Co.

TURBINES
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
S. Morgan Smith

TURBINES (Water)
Rodney Hunt Machine Co.

TURBO-GENERATORS
Allis-Chalmers Mfg. Co.
Chicago Electric Co.
De Laval Steam Turbine Co

USED EQUIPMENT
Chicago Electric Co.
Shartle Brothers Machine Co.,

VACUUM CONTROL
A. E. Broughton Co.

VALVE DISCS
The Richardson Co.

VALVES
The Bristol Company
The Brown Instrument Co.
Crane Co.
Duriron Company
The Foxboro Company
E. D. Jones & Sons Co.
D. J. Murray Mfg. Co.
Mason-Neilan Regulator Co.
Minneapolis-Honeywell Co.
Ross Engineering Corp.
Shartle Brothers Machine Co.,
Trimbey Machine Works
Walworth Co.

VARIABLE SPEED DRIVES
Horton Manufacturing Co.

VENTILATING SYSTEMS
J. O. Ross Engrg. Corp.

WASHERS
Bird Machine Company
Downingtown Mfg. Co.
Fibre Making Processes, Inc.
Improved Paper Mchy. Corp.
E. D. Jones & Sons Co.
Moore & White Co.
Oliver United Filters Inc.
Swenson Evaporator Co.
Traylor Engrg. & Mfg. Co.

WASHERS (Felt, Endless)
Rodney Hunt Machine Co.

WASHER CYLINDERS
Midwest-Fulton Machine Co.

WASHING ENGINES
Midwest-Fulton Machine Co.

WATER ANALYSIS EQUIPMENT
W. A. Taylor & Co., Inc.

WATER WHEELS
Rodney Hunt Machine Co.

WAXING MACHINERY
Potdevin Machine Co.
Shartle Brothers Machine Co.,
Strachan & Henshaw, Ltd.
Waldron, John, Corp.
Weber, Herman G.

WAX SIZE
American Cyanamid & Chemical Corp.
Bennett, Inc.
National Oil Products Co.
Paper Makers Chemical Corp.

WELDING
S. Morgan Smith

WHEATSTONE BRIDGES
Leeds & Northrup Company

WET MACHINES
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Montague Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

WINDERS & REWINDERS
Beloit Iron Works
Black-Clawson Company
Cameron Machine Co.
Davis, Frank H., Co.
Dietz Machine Works
Downingtown Mfg. Co.
Langston Co., Samuel M.
Moore & White Co.
Potdevin Machine Co.
Smith & Winchester Mfg. Co.
Strachan & Henshaw, Ltd.
The Textile Finishing Machy Co.
John Waldron Corp.

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Castle & Overton, Inc.
Improved Paper Mchy. Corp.
International Wire Works
Lindsay Wire Weaving Co.
Purves Machine Wire Co., Inc.

WIRE CLEANERS
Magnus Chemical Co.

WIRE CLOTH
International Nickel Co.
Oliver United Filters, Inc.

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Moore & White Co.
John Waldron Corp.

WIRE GUIDE ROLLS
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WOOD TANKS
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Rodney Hunt Machine Co.

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The Cincinnati Rubber Mfg. Co.
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Walworth Co.

WRENCHES (Ratchet))
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